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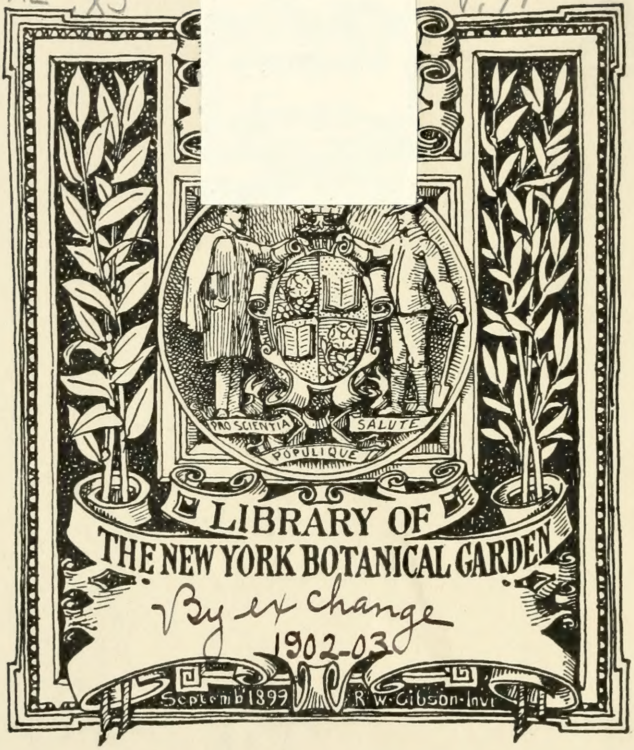

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EXPERIMENT STATION RECORD.

VOL. XIV. SEPTEMBER, 1902. No. 1.

Although fine buildings do not insure an efficient and progressive experiment station, they contribute to this end, and they show the high regard in which the institution is held. They are indicative of the place which the station occupies as a State institution, and of its permanency; and, aside from furnishing superior facilities for investigation, they should stimulate to higher effort. The condition of the stations in this respect has been greatly improved within the past few years, as the result of specific State appropriations, a recognition on the part of the States which has been most gratifying, and has given encouragement to directors and workers alike.

But there is a danger that unless additional funds are given for general maintenance, these fine buildings may prove an embarrassment to the stations by increasing the expense of operation and the demands upon them. The increased laboratory and office facilities bring with them additional expenses for heat and light, janitor service, and incidental expenses, which are frequently not taken account of by those who appropriate the money. It is but reasonable to expect that such public buildings will be properly cared for and kept in good state of repair. A dirty, unkempt building reflects discredit upon the whole institution. Fortunately, such are not often found, although occasionally lack of means is plead in extenuation of a condition which is far from being a credit to a scientific institution.

Moreover, if the appropriation for the new building is not sufficient to cover the necessary equipment, as often happens, the departments occupying it may be seriously embarrassed for several years. New quarters invariably call for considerable additions to the movable equipment of the laboratories. The old fittings are rarely suited or adapted to the new rooms, and, at best, look out of place. More modern forms of apparatus and more permanent arrangements seem desirable in place of the former makeshifts. The result is that unless the appropriation makes provision for these, they are likely to be supplied out of the regular allotment for the several departments, diminishing the funds available for experiment and research. In a number of cases the efficiency of the departments has been temporarily reduced in consequence of this, and the investigations actually set back several years. And, finally, improvement in buildings and equipment unmistakably carries with it increased obligations. The public quite naturally expects more from a station which has been amply provided with quarters and equipment than one which has been compelled to run along from year to year without these improvements.

These considerations are not cited as reasons why the stations should not seek to obtain suitable accommodations for their work and adequate and thoroughly modern equipment for it. The improved facilities are one of the most encouraging signs of the times, as marking real progress. But the time is coming in most of the States, and is at hand in many of them, when increased funds for general maintenance are a more real and pressing need than additional buildings, or men even. The demands made upon the station for its services in a variety of directions have necessitated broadening and extending its work, until in many States it has reached the extreme limit which the present funds will allow. In not a few cases we have more departments than there are funds for, so that a part of them are stifled and held down to the sheerest necessities. Moreover, the character of the work of the stations is gradually undergoing a change. The simpler and more superficial problems in many lines of agriculture have been solved to a large extent, and demonstrated beyond doubt. The more complex and intricate investigations, involving deeper and more time-consuming research, will be the field more largely occupied by the leading stations in the future. Some have already entered it, and others are being stimulated and led on by their example. This means a more specialized station staff, assigned primarily to station work. There is a gradual tendency in that direction, and any movement in the direction of increasing the duties of station workers in elementary instruction is unmistakably to be regarded as a retrograde movement.

These conditions, as well as the more expensive plants of the stations, call for larger means for general maintenance; and this need is becoming imperative if the stations are to continue to advance in accordance with the demands which their popularity has brought about. Fortunately progress is being made in that direction, and State appropriations for special lines of investigation are increasing every year.

Every State has some leading branch of agriculture which would be especially benefited by the station's work, or some line in which special interest might be aroused which might be utilized in securing State appropriations. The stations have so abundantly demonstrated their usefulness and justified their cost that in most States organized interests can be incited to action if the needs are brought before them properly. It is a matter in which the interest is mutual. The success of every station helps all the others by example and precedent, and strengthens the whole cause.

It is a rather noteworthy fact that the Secretary of Agriculture should be invited to address such a body as the National Educational Association, upon a subject related to education in a special field, but it is significant of the position which the head of the National Department of Agriculture has attained within the past few years. Secretary Wilson's subject was, "The education of the American farmer," and the manner in which he treated it showed that he had bestowed much study on this branch of industrial education and its needs and requirements, and was thoroughly conversant with the latest progress and views regarding it. It was an earnest plea for the education of "the producers of wealth," to the end that they might not only become more intelligent and efficient in their craft, but might live on higher levels of comfort and happiness, and have more time to devote to intellectual, moral, and spiritual life.

Agricultural education was characterized as "the great field of applied science where the grower seeks the help of the scholar, of the experimenter, and of the observer." The breadth of the subject and its relations make it necessary that study "should begin with the primary school and continue through life. . . . The four-year college course does not begin soon enough nor continue long enough to meet the requirements of our day in this regard. Teachers are wanted in primary and secondary schools and in postgraduate work in the universities. They are wanted to do work that has not been done in all the ages—the discovery of truths underlying production, and their application to the farm."

Secretary Wilson commended very heartily the movement in a number of the States looking toward the introduction of the elements of agricultural science into common and secondary schools. The education of the teachers in these schools he believed to be the place to begin, and he advised that this should be provided at the expense of the State. "The faculty of the agricultural college of the State is the repository of this information, and the teachers should have their expenses paid while they are becoming possessed of it." The magnitude and character of this new departure should command the highest order of ability in working out the pedagogic scheme and in effecting the proper organization. "We want a man now to organize the education of half the people under our flag, who till the soil and furnish 65 per cent of our exports; who create the wealth of the country from materials found in earth, air, and water; we want organization from the primary schools to the university and beyond into fields, where things grow; into the stable and yard, through which crops go to the market; into the factory, where skill should add to value; into the pasture, where skill should direct form, feature, and development; into the cultivation, where science should defy drought and deluge; into fertilization, where observation and experience must be supplemented by education regarding soils and their composition."

The Secretary called attention to the growing need for education to assist not only the farmer himself, but all the agencies which are working in his interests, such as the National Department of Agriculture, the agricultural colleges, the State experiment stations, the high schools of agriculture, agricultural societies, the agricultural press, writers of books on agriculture, etc. All these agencies need more and better equipped men; and the best method of preparing them for their work is one of the unsolved problems in education. "Five thousand students attend agricultural colleges, but these colleges are feeling their way in the dark along untraveled paths. They are fitting and trying, as carpenters built barns in old times. They will at last forge out a system that will meet the requirements of producers and be entirely new and suitable to our conditions as a people." Summarizing the present status of agricultural education, he said in conclusion: "We find that progress is being made toward the education of the farmer; that belief is extending regarding its interest; that opposition is vanishing among educators whose studies did not include the science of the farm; that demand for instructors and organizers along these lines is growing; that, as a nation, our power for good at home and abroad depends upon the education of all our citizens; and that all classes, kindreds, tongues, and peoples look to you, the educators of America, to lift the whole up to higher intellectual and moral altitudes."

In 1867 the Royal Society of London commenced the publication of a Catalogue of Scientific Papers, to serve as an index to all important contributions to science contained in the transactions of societies, journals, and other periodical literature. The review began with publications of the year 1800, and the results of the compilation were issued from time to time in large quarto volumes of about 1,000 pages each. The eleventh volume, issued in 1895, brought the catalogue down to 1883; and a supplementary volume (volume 12) has just been issued, which is devoted to the more important papers omitted from the earlier volumes. This last volume embraces upwards of 350 serials, which were selected with care from a preliminary list of periodicals not previously catalogued.

The stupenduous nature of this undertaking is readily apparent, and the end is not yet, for the period from 1883 to 1900 remains to be compassed. The Royal Society purposes to complete the catalogue up to the close of the nineteenth century, at which point the work has already been taken up by an international organization.

The society announces that the Catalogue of Scientific Papers from 1883 to 1900 is now in hand, and that considerable progress has been made on a classified index to the twelve volumes already issued. As the arrangement is at present by authors only, the classified index will greatly enhance the value of the work and will make it an incomparable aid in looking up the literature upon a given subject.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Report of the chemical laboratory of the Ploti Agricultural Experiment Station, B. M. Velbel (*Six. Rap. An. Sta. Expt. Agron. Ploti, 1900, pp. 73–111, 215–234*).—The work of this department of the station during the year included chemical studies of atmospheric precipitation, lysimeter water, products from the field experiments, and methods of analysis. It is a continuation of that of previous years (E. S. R., 12, p. 916) and has for its primary object a study of the evolution of the combinations and the annual balance of nitrogen in the soil. This involves the determination of the nitrogen brought down by precipitation, that lost in the drainage water, and that taken up by the products grown on the soil. The ammonia, nitrites, and nitrates in the atmospheric precipitation are reported. The lysimeters, having the same surface area as the rain gauges, viz, 500 sq. cm., were so placed as to collect drainage water to depths of 30 cm. (arable soil), 45 (arable and subarable soil), and 1 meter (subsoil). The relative solubility of the soil constituents, as shown by the analyses of the lysimeter waters, was (1) organic matter, (2) lime, (3) nitrates, (4) sodium chlorid, (5) silica, (6) magnesia, (7) iron oxid and alumina, (8) potassium chlorid, (9) phosphoric acid, and (10) sulphuric acid, i. e., organic substances and combinations of lime and nitric acid, probably $Ca(NO_3)_2$, predominated in the humus-calcareous soils experimented with. The effect of plant cover in reducing drainage losses was strikingly shown in these observations. The results show such a rapid removal of organic matter, nitrogen, and mineral matter from the arable layer (30 cm. deep) of the soil that impoverishment of the upper soil would soon result if the losses were not replaced. The amount of these constituents carried by the drainage water to a depth of 50 cm. was still quite large, but under the normal conditions obtaining in these observations the amount of drainage at 1 meter depth was very small (25 cc. during the year). From data showing the amount of combined nitrogen found in the drainage water during the year, it is estimated that one acre of the arable layer of the soil (to a depth of 30 cm.) yielded 21.125 lbs. of nitric nitrogen, of the arable and subarable layers (to a depth of 45 cm.) 37.72 lbs. of nitrogen. The rain, etc., which fell during the same period brought down 3.58 lbs. per acre of nitrifiable nitrogen. Deducting this, it appears that the arable layer produced 17.55 lbs. per acre of ammoniacal and nitric nitrogen, and the arable and subarable layers 34.14 lbs. per acre.

A comparison of the nitrogen required by the products grown on the soil with that brought down by rainfall, etc., shows the latter to be almost insignificant, and emphasizes the importance of adopting a system of culture and cropping, especially of green manuring, which will replace the losses which occur.

A method for determining small quantities of carbonates, A. D. Hall and E. J. Russell (*Jour. Chem. Soc.* [*London*], *81* (*1902*), *No. 470, pp. 81–85, fig. 1*).—Methods employing Scheibler's apparatus are stated to be inaccurate for substances such as soils containing as little as 0.5 per cent of calcium carbonate, due to the solubility of the carbon dioxid in the acid used in decomposing the carbonates. The method proposed by the authors is based upon the change in pressure produced when the unknown volume of gas, produced by the action in a partial or complete vacuum of dilute sulphuric acid upon the substance containing the carbonate, expands by a known volume which is measured by means of a glass bulb of known capacity and a manometer connected with the generating bulb. The apparatus used is described, the method of calculation of results is explained, and a number of determinations by the method are reported.

On the estimation of alkaline hydrate or bicarbonate in the presence of monocarbonate, B. North (*Jour. Soc. Chem. Ind., 21 (1902), No. 5, pp. 322–325*).

The detection of magnesia in ammonium oxalate precipitates of lime, A. Täubner (*Chem. Ztg., 26 (1902), No. 23, p. 246*).—It is stated that magnesium oxalate is sufficiently soluble in water to give a precipitate of silver oxalate when silver nitrate is added to the wash water of calcium oxalate precipitates.

The determination of cæsium and rubidium as hydrosulphate and of potassium and sodium as pyrosulphate, P. E. Browning (*Ztschr. Anorgan. Chem., 29 (1901), No. 1, pp. 140–144*).—Salts of cæsium and rubidium with volatile acids give acid salts of the type $RHSO_4$ when treated with an excess of sulphuric acid and heated to constant weight at 250 to 270° C., and neutral salts of the type R_2SO_4 when heated to glowing. Under the same conditions potassium and sodium salts give pyrosulphates of the type $R_2S_2O_7$, which on heating are transformed into the neutral salts R_2SO_4.

A contribution to the knowledge of metaphosphate, A. Wiesler (*Ztschr. Anorgan. Chem., 28 (1901), No. 3, pp. 177–209, figs. 3*).

On calcium carbophosphate, A. Barillé (*Répert. Pharm., 1901, p. 145; abs. in Centbl. Agr. Chem., 31 (1902), No. 2, p. 136*).—The author studied the solution of calcium phosphate in a water solution of carbon dioxid under pressure. He found that under these conditions a very unstable compound of biphosphate with carbon dioxid was formed, to which he gives the formula $P_2 O_8 H_2 Ca_2 2CO_2$. By the action of carbon dioxid on tricalcium phosphate there was formed first a biphosphate and calcium bicarbonate. The presence of the latter reduced the solubility of the biphosphates in water containing carbon dioxid to a very marked extent. Attempts to separate the calcium carbophosphate by cooling or adding alcohol failed, decomposition and evolution of carbon dioxid taking place under this treatment. No reaction took place when dry calcium biphosphate was treated with dry carbon dioxid.

Phospho-molybdenum compounds, F. Mawrow (*Ztschr. Anorgan. Chem., 28 (1901), No. 2, pp. 162–166; 29 (1901), No. 1, pp. 156–158*).

The use of weak solvents in soil analysis, A. D. Hall and F. J. Plymen (*Jour. Southeast. Agr. Col., Wye, 1902, No. 11, pp. 90–99, figs. 3*).—Comparative tests of citric, hydrochloric, acetic, and carbonic acids, and ammonium citrate as solvents for available phosphoric acid and potash in Rothamsted soils of known history are reported. The citric-acid method proposed by Dyer seemed to give results most in accord with what was known of the soils.

Report of the subcommittee on uniformity in analysis of materials for the Portland cement industry (*Jour. Soc. Chem. Ind., 21 (1902), No. 1, pp. 12–30*).

The determination of nitrates in water by the indigo carmine method, S. R. Trotman and H. Peters (*Jour. Soc. Chem. Ind., 21 (1902), No. 10, pp. 694, 695*).—The method proposed is as follows: "From 5 to 20 cc. of the water under examination is mixed with 25 cc. of indigo carmine solution. To this is added concentrated sulphuric acid equal in amount to the united volumes of the water and indigo carmine solution. The whole is then heated on the sand bath for 15 minutes. At the end of this time, the excess of carmine solution is titrated with a standard solution of potassium permanganate. In a similar manner, and alongside the above, a blank estimation is done, replacing the water under observation by distilled water. The difference between the two titrations is the amount used by the nitrates in the water. The permanganate solution is standardized by means of standard solution of potassium nitrate containing 0.0001 gm. of nitrogen per cubic centimeter."

The determination of nitrogen, E. DURAND (*Ann. Chim. Analyt., 7 (1902), pp. 17, 18; abs. in Chem. Centbl. 1902, I, No. 9, p. 541*).—The author uses a copper digestion flask and employs copper sulphate or oxid instead of mercury.

Contribution to the determination of nitrogen, A. HEBEBRAND (*Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), pp. 61, 62, figs. 2; abs. in Chem. Centbl., 1902, I, No. 9, p. 541*).—A description is given of an Erlenmeyer flask with a U-tube blown in its side which is recommended for the collection of the distillate in the Kjeldahl process.

A modified Argand burner for the first process in the Kjeldahl estimation of nitrogen, J. GOLDING (*Jour. Soc. Chem. Ind., 21 (1902), No. 10, p. 694, fig. 1*).—"This is a simple device, consisting of a clip attached to a thin brass rod, the other end of which passes through a thicker rod, which screws into the foot of the Argand burner. The clip supports the neck of the flask, the weight of which rests on a pipeclay triangle; the rod is adjusted to the desired height by means of a screw in the end of the thicker rod. The advantages of using these burners are: (1) That a very low even heat can be obtained, thus enabling the determination of the nitrogen in liquids and solids which have a tendency to froth with the strong sulphuric acid; (2) that a strong heat can be produced without danger of the flasks breaking; (3) that the burners can be used for other purposes."

On the Kjeldahl method, C. NEUBERG (*Beitr. Chem. Physiol. u. Path. Ztschr. Biochem., 2 (1902), No. 4, p. 214*).—The author proposes the use of sodium thiosulphate to break up mercury compounds before distillation.

Inorganic ferments, D. MCINTOSH (*Jour. Phys. Chem., 6 (1902), No. 1, pp. 15–44*).—This is a study of the reducing action of colloidal silver and mercury on hydrogen peroxid.

Provisional methods for the analysis of foods adopted by the Association of Official Agricultural Chemists, November 14–16, 1901, edited by H. W. WILEY and W. D. BIGELOW (*U. S. Dept. Agr., Bureau of Chemistry Bul. 65, pp. 169, figs. 7*).—The bulletin is made up of the reports of the referee and his associates as amended and adopted provisionally by the association (E. S. R., 13, p. 411). Methods are given for the examination of the following: Meat and meat products, by W. D. Bigelow; edible oils and fats, by L. M. Tolman; dairy products, by J. A. Le Clerc; infant and invalid foods, by H. W. Wiley; saccharine products, by A. E. Leach; canned vegetables, by L. S. Munson; spices, by A. L. Winton; vinegar, by W. Frear; flavoring extracts, by A. S. Mitchell; fruits and fruit products, by L. S. Munson and L. M. Tolman; fermented and distilled liquors, by W. D. Bigelow; baking powders and baking-powder chemicals, by A. L. Winton; food preservatives, by W. M. Allen, and coloring matter, by L. M. Tolman. Reference tables are added and an appendix gives suggestions from numerous analysts which, though not adopted by the association, were thought to be valuable and worthy of consideration.

Composition of nitrogen-free extract matter in potatoes, C. H. JONES and B. O. WHITE (*Vermont Sta. Rpt. 1901, pp. 209–216*).—Analyses of the nitrogen-free extract matter of 32 composite samples of potatoes of the crop of 1898 and 41 samples of the crop of 1899 are reported. Marketable and small potatoes of the White Star and Delaware varieties were examined in 1898, and of the Delaware variety in 1899. The potatoes were dug at different intervals during the growing season. The official methods of analysis, with some modifications noted, were employed. The aqueous extract was calculated as dextrin and soluble starch after allowing for the reducing sugars present. Starch was inverted by treating with 5 cc. hydrochloric acid for 45 minutes in a water bath at 90° C. Reducing sugars were present in small quantities and showed considerable variations among individual samples. Dextrin and soluble starch were present in large quantities, which is considered as probably largely due to a change in the starch occurring during the preparation of the sample for analysis. It is recommended, therefore, that the analysis of the nitrogen-free extract matter should be made on the fresh undried sample. The starch contents varied indirectly with the amount of dextrin and soluble starch determined. The average composition of the marketable potatoes grown in 1899, calculated to the original substance, was as follows: Moisture 79.41 per cent, crude ash 1.26, crude protein 2.28, crude fiber 0.36, reducing sugars 0.09, dextrin and soluble starch 1.35, starch 14.51, ether extract 0.06, and undetermined 0.68 per cent.

Composition of nitrogen-free extract matter in artichokes, C. H. JONES and B. O. WHITE (*Vermont Sta. Rpt. 1901, pp. 217–219*).—Analyses of the nitrogen-free extract matter of 14 samples of artichokes obtained at different intervals during the season are reported. The average composition of 6 samples dug in November calculated to the original material was as follows: Moisture 79.59 per cent, crude ash 1.51, crude protein 2.12, crude fiber 0.74, reducing sugars (largely levulose) calculated as dextrose 0.70, sugars (levulin and a sugar resembling sucrose) calculated as sucrose 12.05, inulin 1.92, ether extract 0.08, and undetermined 1.29 per cent.

Concerning the sugars and organic acids in tropical fruits, A. BORNTRAEGER (*Staz. Sper. Agr. Ital., 34 (1901), No. 10, pp. 975–992; Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 4, pp. 145–155*).—The fruits studied included *Diospyros lotus, D. virginiana, D. kaki, Sorbus domestica, Mespilus germanica, Arbutus unedo, Musa sapientium*, and *Eryobotrya japonica.*

The constituents of corn pith and elder pith and the occurrence of arabin and xylene together in plants, C. A. BROWNE, JR. (*Inaug. Diss., Göttingen, 1901, pp. 51; Ber. Deut. Chem. Gesell., 35 (1902), No. 8, pp. 1457–1467*).—The author reports investigations carried out in the laboratory of Prof. B. Tollens. The composition of the two kinds of pith, as determined by the Weende method, was as follows:

Composition of corn pith and elder pith.

[Air-dry condition.]

Constituents.	Corn pith.	Elder pith.
	Per ct.	*Per ct.*
Water	9.81	11.28
Crude fiber	38.24	61.26
Ash	4.04	1.71
Fat	1.26	1.06
Protein	2.99	2.22
Nitrogen-free extract	43.66	22.47

The percentage of pentosans obtained by distillation with hydrochloric acid (1.06 sp. gr.) ranged from 24.45 to 27.04 per cent for corn pith, and was 18.81 per cent for elder pith. A mechanical separation was made of the fibrovascular bundles of corn pith from the fundamental tissue, and each examined separately. The latter constituted about three-fourths of the pith. Analysis showed practically no difference in the percentages of pentoses, fiber, and nitrogen-free extract in the two parts, but the fat and protein were somewhat higher in the fibrovascular bundles. Both kinds of pith were found to contain xylose in relatively large quantities and arabinose as well, from which the author is inclined to the belief that in very many cases, and perhaps in all, the mother substances of these pentoses occur together in nature.

The materials were hydrolized with dilute sulphuric acid and with acid sulphite of calcium, and various other experiments were made. Both kinds of pith were found to contain much cellulose which was not in free condition, but in combination with lignin substances, pentosans, galactan, etc. Pure cellulose was prepared by Cross and Bevan's chlorin method. This pure cellulose, although it gave none of the reactions for pentosans, yielded considerable quantities of furfurol when distilled with dilute hydrochloric acid—5.53 per cent from corn pith cellulose and 5.39 per cent from elder pith cellulose, which the author believes was derived from oxycelluloses which were either present in the original pith or more probably were formed during the oxidation.

The determination of pentoses and pentosans by means of distillation with hydrochloric acid and precipitation of the furfurol by phloroglucin, E. Kröber and C. Rimbach, reported by B. Tollens (*Ztschr. Angew. Chem., 15 (1902), No. 20, pp. 477–482*).—The result of recent investigations of this method are summarized and quite minute directions given as to the distillation, the precipitation of the furfurol, handling of the precipitate, etc. Hydrochloric acid of 1.08 and 1.1 sp. gr. was found to give somewhat higher results than that of 1.06 sp. gr., but the latter is adhered to as giving the more uniform result. The distillate is treated with an excess of phloroglucin, dissolved in 12 per cent hydrochloric acid, and allowed to stand for 12 to 14 hours, after which the precipitated furfurol-phloroglucid is transferred to a porcelain Gooch crucible, washed with 150 cc. of water, and dried for 4 hours in a water bath at 97 to 98°. Kröber has found that it is immaterial whether the phloroglucin is absolutely pure or contains a little diresorcin.

Kröber advises transferring the covered crucible to a stoppered weighing glass and placing this in a desiccator to cool, as by this means the hygroscopic phloroglucid is best protected from moisture. Drying for 4 hours is found to be sufficient, and allowing the open crucible to stand exposed to the air results in material increase in weight. The principal cause of lack of concordance in the results is the solubility of the phloroglucid in the 400 cc. of precipitant plus the 150 cc. of wash water. Rimbach found in special experiments that 0.005 gm. of phloroglucid was dissolved, and Kröber, on an average, 0.00518 gm. The use of a correction of 0.0052 gm. is suggested, and formulas are given on that basis. Kröber has prepared a table showing the amounts of pentoses and pentosans corresponding to different amounts of phloroglucid from 30 to 300 mg. This table is based upon special determinations made with all possible exactness. The results are generally somewhat lower than those previously given, but the close concordance between the data given by Rimbach and Kröber indicates the correctness of the new figures. A portion of the data are given in the following table:

Amounts of pentosans and pentoses corresponding to different amounts of phloroglucid.

Phloroglucid.	Furfurol.	Arabinose.	Araban.	Xylose.	Xylan.	Pentose.	Pentosan.
Gram.	*Gram.*	*Gram.*	*Gram.*	*Gram.*	*Gram.*	*Gram.*	*Gram.*
0.030	0.0182	0.0391	0.0344	0.0324	0.0285	0.0385	0.0315
.050	.0286	.0611	.0538	.0507	.0446	.0559	.0492
.074	.0411	.0875	.0770	.0726	.0639	.0801	.0700
.100	.0546	.1161	.1022	.0964	.0848	.1063	.0935
.169	.0904	.1919	.1688	.1592	.1401	.1756	.1546
.200	.1065	.2250	.1984	.1874	.1649	.2065	.1817
.300	.1581	.3335	.2935	.2784	.2450	.3060	.2693

Although the above factors represent the greatest exactness as yet obtained by this method, Professor Tollens states that it should be remembered that the present method for pentosan can not be regarded as an absolutely exact one, but only as a conventional method, which is the best we now have. In addition to the pentoses there are other materials, such as oxycellulose and glucuronic acid, which also yield furfurol; and, furthermore, methyl-pentosans may occur, yielding methyl-furfurol in the distillation, which in turn is precipitated as phloroglucid. These considerations, however, do not prevent the use of the pentosan method as a conventional method, and the employment of Kröber's method of weighing the phloroglucid and the use of his table will give more uniform results.

Employment of the pentosan determination in testing various vegetable materials and paper stock, E. Kröber and C. Rimbach, reported by B. Tollens (*Ztschr. Angew. Chem., 15 (1902), No. 21, pp. 508–510*).—The results of tests of various fiber substances are reported, indicating the applicability of the pentosan determination to the testing of paper stock for wood fiber, etc.

On the alleged reaction of brucin on nitrous acid, G. Lunge (*Ztschr. Angew. Chem., 15 (1902), No. 1, pp. 1–3*).—The author reports experiments which lead to the conclusion that brucin acts only on nitric acid and not on nitrous acid, and that if a brucin reaction is obtained in a nitrate solution free from nitric acid it is due to the formation of nitric acid from nitrous acid during the manipulation of the method.

On the behavior of nitric and nitrous acids toward brucin sulphuric acid, L. W. Winkler (*Ztschr. Angew. Chem., 15 (1902), No. 8, pp. 170–172*).—The author reports experiments which show that, contrary to the statement of G. Lunge, nitrous acid reacts more readily upon brucin than nitric acid.

The present status of the chemistry of albumin (*Ber. Deut. Chem. Gesell., 34 (1901), p. 3214; abs. in Amer. Chem. Jour., 27 (1902), No. 2, pp. 147–154*).—A summary of some of the more recent theories and experiments on the chemistry of albumin.

The effect of nascent chlorin upon proteids, R. Ehrenfeld (*Ztschr. Physiol. Chem., 34 (1902), No. 5–6, pp. 556–579*).

The coagulable material in the white of egg, L. Langstein (*Beitr. Chem. Physiol. u. Pathol. Ztschr. Biochem., 1 (1901), p. 83; abs. in Hyg. Rundschau, 12 (1902), No. 5, p. 239*).—A chemical study.

The fluorin content of teeth and bones, I, Jodlbauer (*Ztschr. Biol., 41 (1901), No. 4, pp. 487–492*).—Methods of estimating fluorin are critically discussed.

Miscellaneous analyses, C. H. Jones and B. O. White (*Vermont Sta. Rpt. 1901, pp. 223–226*).—Analyses of 48 samples are reported, including nitrate of soda, dried blood, tankage, ground bone, bone dust, acid phosphate, muriate of potash, double manure salt, wood ashes, home-mixed fertilizers, muck, jadoo fiber, gluten meal, dried prepared squash, graham flour, and sugar feed.

New apparatus in water analysis, G. E. Thomas and C. A. Hall (*Jour. Amer. Chem. Soc., 24 (1902), No. 6, pp. 535–539, figs. 4*).—Apparatus for determining free and albuminoid ammonia, for collecting samples from reservoirs or rivers, for the determination of dissolved oxygen or carbon dioxid, and for filtering water for the determination of suspended matter are described.

New extraction apparatus, A. Landsiedl (*Chem. Ztg., 26 (1902), No. 25, pp. 274, 275, figs. 3*).—Apparatus for use with solvents of high and low boiling points and for hot extraction are described.

A drying oven with circulation of air, W. Gallenkamp (*Chem. Ztg., 26 (1902), No. 23, p. 249, fig. 1*).

BOTANY.

The flora of the metamorphic region of Alabama, F. S. Earle (*Alabama College Sta. Bul. 119, pp. 43–120*).—A list is given of the ferns and flowering plants of the metamorphic region of Alabama, based on the collections present in the herbarium of the Alabama Polytechnic Institute. This region is of botanical interest since it constitutes the southern extension of the Carolina life zone. A list is given of 1,146 species and varieties, 94 of which are new to the State.

Some changed conditions of our flora incident to the settlement of the State, L. H. Pammel (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 107–112*).—Attention is called to some of the notable changes that have taken place in the flora of Iowa, which are attributed to the settlement and cultivation of the land. Data are given relating to the growth of a number of trees known to be 50 years old or less, including the height and circumference of individual trees. Changes brought about by the construction of wind-breaks and hedges are mentioned, and the introduction of numerous classes of weeds is commented upon.

Review of the most useful plants of the family Leguminosæ, E. Goeze (*Wiener Illus. Gart. Ztg., 26 (1901), No. 1, pp. 15–28*).—The leguminous plants cultivated for human food, forage, or other useful purpose, are catalogued for Europe, America, Asia, Africa, and Australia.

Notes on the northeastern Carices of the section Hyparrhenæ, M. L. Fernald (*Proc. Amer. Acad. Arts and Sci., 37 (1902), No. 17, pp. 447–495, pls. 5*).—A synopsis is given of the species of Carex occurring in the northeastern United States, as indicated in the above title.

The variations of some boreal Carices, M. L. Fernald (*Proc. Amer. Acad. Arts and Sci., 37 (1902), No. 17, pp. 495–510*).—Attention is called to the wide variation occurring in some of the species of Carex which frequent the higher latitudes of North America, Europe, and Asia.

The arrangement of the air canals in the stalks of Nymphæas, M. T. Masters (*Jour. Roy. Hort. Soc. [London], 26 (1902), No. 4, pp. 840–843, figs. 2*).—The author claims that by a study of the transverse sections of the leaf and flower stalks of water lilies it is possible to present a scheme for classification of the different species. The air passages in the stems arrange themselves in definite orders, and a key is given for the determination of species based upon this character.

Behavior of mutilated seedlings, B. D. Halsted (*Abs. in Science, n. ser., 15 (1902), No. 376, pp. 407, 408*).—The form of mutilation of seedlings reported upon is that of the removal of the plumule. In radish seedlings the first change noticed was a deeper green of the cotyledons, followed by a remarkable elongation of the petioles. The cotyledons became thicker than in normal plants, due to an increase in size of the cells which were filled with starch. A somewhat similar behavior was noted for the cotyledons of the morning-glory plants, while the hypocotyls became enlarged and served as repositories for a large accumulation of starch. In the Hubbard squash the cotyledons remained close to the earth and grew to a length of 4 or more inches, and remained green for more than 4 months. In experiments with eggplant the rigid upright cotyledons became quite fleshy and remained alive for several months. With sunflower the hypocotyl elongated until it attained a length of over 9 in., the primitive structure being retained. These experiments show that an organ normally designed to store food for the developing seedling may, in case of an emergency, persist and take on a greatly increased size for that purpose. Along with the other changes in the seed leaves, the hypocotyl becomes remarkably thickened and green in the morning-glory, and greatly elongated but slender in the sunflower.

The embryology and germination of the genus Peperomia, D. S. Johnson (*Abs. in Science, n. ser., 15 (1902), No. 376, pp. 408, 409*).—The ripe seed of this genus is about 0.5 mm. long, with a very small embryo surrounded by an endosperm 0.1 mm. in diameter. In germination the endosperm bursts out of the seed coat, but continues as a sort of jacket, 2 cells in thickness, to inclose the embryo until the latter, after reaching a size of 0.15 mm. as a globular mass of cells, at length develops 2 cotyledons and a root. The latter bursts through the endosperm and bending downward anchors in the soil. From the beginning of its development to the time when it drops, the endosperm seems never to serve for the storage of food material, but always as a digesting and absorbing organ for dissolving and passing to the embryo the starch contained in the perisperm. This is said to be the sole function of the endosperm in a number of other genera in which there is an abundant perisperm.

On kaki-shibu, a fruit juice in technical application in Japan, M. Tsukamoto (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 329–335*).—The name **kaki-shibu** is given in Japan to the juice of the unripe fruit of the Japanese persimmon or kaki tree (*Diospyros kaki*). This juice is used for the preservation of fish nets and lines, and as an application to packing papers, making them less penetrable to moisture, to tubs and wooden vessels, etc. There are two well-known varieties of kaki in Japan. In one the fruit becomes sweet when ripened, while the other remains astringent and is very rich in tannin, yielding a great quantity of the juice desirable for making kaki-shibu. When the fruit of this variety is fully grown, it is crushed and mixed with water, the mixture being allowed to remain 3 or 4 days in large tubs, when a kind of fermentation sets in, accompanied by the evolution of gas. The juice is generally prepared in August and may be applied fresh or after standing for 2 or 3 years. In contact with the air a film is formed over the surface, probably by oxidation. The solution leaves on evaporation an insoluble film that fills the pores of fibers and woods, diminishing their water-holding capacity and preventing the entrance of destructive fungi. The chemical properties of this material are described, the most characteristic constituent seeming to be a kind of tannin which has some abnormal properties. Tannin determinations have been made, and both gallotannic and quercitannic acids have been found present, constituting a large percentage of the dry matter. The industrial value of kaki-shibu, it is claimed, is due to the tannin, which differs from other tannins in being insoluble in water and alcohol, and soluble in dilute acids.

On the formation of asparagin in the metabolism of shoots, U. SUZUKI (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 351–356*).—While the various amido-compounds formed from protein during the germination process disappear gradually, with the further development of the shoots, the asparagin is said to increase to a certain phase, after which it also disappears. The amount of carbohydrates present in the seed seems to bear a direct relationship to the disappearance of the asparagin. With seeds rich in protein the accumulation of asparagin is greater. The author conducted a series of experiments with barley and soy-bean shoots which seem to confirm the previous observations of Palladin that asparagin must be considered as a synthetic product formed with the aid of an oxidation process, after partial destruction of the primary amido-compounds. In etiolated shoots the decomposition of protein continues in the absence of oxygen as well as in its presence. This is in accordance with what is known as the action of enzyms. A very decided difference in the production of asparagin is noticeable, there being no increase in the absence of oxygen, but only in its presence.

The amount of soluble albumin in different parts of plants, H. UNO (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 391–393*).—A report is given of studies of the different parts of plants for albumin, the investigations hitherto reported being mostly of seeds. Quantitative determinations were made of the roots, leaves, and flowers of rape, radish, cabbage, flax, barley, orchard grass, buckwheat, Astragalus, beans, peas, clover, Lathyrus, and potatoes. In most cases the leaves were found to contain the most soluble albumin. In leguminous plants, however, the greatest amount was present in the roots. This is doubtless due to the presence of tubercles upon the roots, the nodules not having been removed before the juice was expressed. In general, the stalks of the plants contain less soluble albumin than the roots. The influence of the flowering stage of the plant on the content of soluble albumin was investigated; but further studies will be required before general conclusions can be drawn.

On the juice of the pseudotrunk of Musa basjoo in winter time, S. SAWA (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 399–401*).—According to the author, banana plants grown in central Japan lose their leaves during the cold months, and there remains only the pseudotrunk, the interior of which seems to be sufficiently protected against the freezing temperature of the cold nights by the dead part surrounding it. This inner portion is subjected to a period of rest of about 4 months, and the investigations here reported were conducted to ascertain whether during this time there was any noticeable decomposition of reserve protein. The juice of portions of the trunk was prepared for examination by methods which are described in detail. The results showed that neither asparagin, tyrosin, or leucin were present; hence that in the period of rest no decomposition of protein takes place in the juice of the plant.

The poisonous action of quinone, T. FURUTA (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 407-410*).—While many of the phenol derivatives have been tested for their poisonous properties, quinone seems to have been wholly neglected. According to Beijerinck, this substance is produced by the action of a soil fungus (*Streptothrix chromogena*) on certain proteids. The author has conducted a series of experiments with this substance to ascertain whether it is a general poison, his experiments being made with shoots, twigs, leaves, various algæ and fungi, bacteria, insects, tadpoles, and mice. The different experiments are briefly outlined, and from the results obtained it is concluded that quinone is a strong poison, stronger indeed than the other closely related benzin derivatives. As a result of his investigations the author thinks there is little basis for the hypothesis of Beijerinck that the relatively large amount of humus in the soil is due to the action of quinone. He believes that if quinone is produced by the soil fungus it must be changed as soon as formed, for otherwise animal and vegetable life in the soil would be destroyed.

Are caffein and antipyrin in high dilutions poisonous to plants? S. SAWA (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 411, 412*).—The author carried on experiments with onion plants to determine the poisonous action of these alkaloids in high dilution. The plants remained alive for nearly four weeks in a solution containing 1 part of the alkaloids to 1,000 of the nutrient solution. The caffein gradually proved to be more injurious than the antipyrin. In the second experiment in which young celery plants were used the amount of the bases added to the solution was 0.1 and 0.25 per cent, respectively. In about 2 weeks the injurious action of the alkaloids was observed, commencing with the wilting of the leaves. The injurious effect of caffein in this high dilution appears remarkable since the epidermis of tea leaves is comparatively rich in it and remains uninjured. It is believed that the caffein here present is localized in the vacuoles and surrounded by such a density of cytoplasm as to protect the cell against injury.

Has urea any poisonous action on phænogams? S. SAWA (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 413, 414*).—As urine is sometimes applied as a manure before its urea is completely split up by bacterial action into ammonia and carbonic acid, the author has investigated the poisonous action of urea toward phænogams. Four plants were placed in a Knop's solution, two receiving an addition of 0.5 to 0.001 of urea. These plants were allowed to remain for 5 weeks in the solution, which was twice renewed during that time. They began the formation of flowers, but only one of those to which urea had been applied made a full flower development. The new branches developed by the 4 plants were much more vigorous on those plants grown in the control solutions than those which had received urea. The leaves began dying and at the expiration of 5 weeks the plants were measured. This showed the injurious action plainly, the control plants having made more than twice the growth of the others.

The poisonous action of potassium persulphate on plants, S. SAWA (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 415, 416*).—Experiments are reported in which a 0.5 per cent solution of potassium persulphate was applied to certain algæ and diatoms, all of which died within 1 hour. Branches of rape plants in the same solution showed an injurious effect within 24 hours. An injurious effect of the same substance when still further diluted was shown on plum branches, the buds being entirely killed within 10 days. Onion plants were more resistant, showing the effects of the chemical on the tips of the leaves after 10 days, at which time growth seemed to stop.

The peculiar rôle of magnesia and sulphates in plant growth, R. Dumont (*Prog. Agr. et Vit. (Éd. L'Est), 23 (1902), No. 10, pp. 292–297*).—A brief general discussion of this subject based on the work of various investigators.

On the influence of different ratios of lime and magnesia upon the development of plants, K. Aso (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 361–370, pls. 7*).—A series of experiments is described in which the unfavorable effects of excesses of magnesia and lime are shown, and a ratio between the two for the most favorable development of crops is indicated. Experiments were conducted with barley, soy beans, and onions, in which the plants were grown under laboratory conditions, the effect of different quantities of both lime and magnesia being noted. In comparing the results it was found that with wheat, barley, and onions the excess of lime over magnesia may be less than with soy beans. The necessity for this difference is attributed to the greater leaf surface developed in the soy beans, necessitating an increase in lime. It is claimed that some attention should be paid to the proper ratio between lime and magnesia in the soils, especially in the available forms of those elements; and for liming the soil it is necessary to know the absolute quantity of lime present and also the ratio between the lime and magnesia. The poisonous action of the magnesia in the absence of lime is shown, and the influence of lime on the greater production of root hairs, and consequently of the absorptive area of the root, is pointed out.

To what extent should soil be limed? T. Furuta (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 371–379*).—A series of experiments was carried on in soil mixtures in which the ratio of assimilable lime and magnesia was definitely fixed. The plants used in the experiment were cabbage, buckwheat, and oats. The ratio of lime to magnesia varied from 3 of lime to 1 of magnesia to 1 of lime to 2 of magnesia. The growth of the plants in the different soils is shown, and the conclusion drawn that the ratio of lime to magnesia for the best production of crops should be 3: 1, for crops which have an abundant leaf production; while for cereals a ratio of 1: 1 gives the best results.

The lime content of phanerogamic parasites, K. Aso (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 387–389*).—On account of the few ash analyses that have been reported of phanerogamic parasites, the author has investigated the subject and gives the results of analyses made of an orchid (*Gastrodia elata*). This plant, while probably not a parasite, exhibits some of the characteristics of parasitic plants in that there is little or no development of chlorophyll.

The lime factor for different crops, O. Loew (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 381–385*).—The author reviews the papers of Aso and Furuta relative to the ratio between lime and magnesia required by plants, and comments upon their results.

Are our native horsetails and ferns poisonous? L. R. Jones (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 70–74*).—A brief résumé is given of opinions relative to the poisonous properties of species of Equisetum, and an account of what is believed to be undoubtedly Equisetum poisoning of horses. It appears probable that *Equisetum arvense* often causes serious poisoning of horses in Vermont, and is fatal when eaten in considerable quantity. It is believed to be the cause of the sickness commonly called blind staggers or stomach staggers, and is doubtless the cause of more loss to stock owners in Vermont than any other poisonous plant. Conflicting evidence is presented relating to its poisonous action in reference to sheep, and cattle are said to feed upon it with impunity. Other species of Equisetum should be regarded as probably poisonous. The common belief seems to be that some of the ferns, particularly the sensitive fern (*Onoclea sensibilis*), are poisonous to horses, but the evidence in favor of this belief does not appear at all convincing.

Germination of Basidiomycetous spores, Margaret E. Ferguson (*Abs. in Science, n. ser., 15 (1902), No. 376, p. 407*).—The investigations briefly outlined were conducted to ascertain the conditions of germination in some of the Basidiomycetes, particularly in the common mushroom (*Agaricus campestris*). In the preliminary tests 12 out of 26 species studied yielded high percentages of germination in various media, the spores of 11 germinating in distilled water. In the case of those spores germinating in distilled water, the percentages of germination were invariably lower than when some food material was supplied. The effect of extremes of temperature, alkalis, acids, and organic substances on the germination of the spores of *A. campestris* was tested. The percentages of germination obtained in these experiments varied from 0 to 25. In other experiments higher percentages of germination were obtained, but these never occurred except in cultures containing the growing mycelium of the fungus.

Physiology of sea water, R. H. True (*Abs. in Science, n. ser., 15 (1902), No. 376, pp. 402, 403*).—A series of experiments is reported in which the alga *Cladophora gracilis* was grown in various solutions to compare artificial and natural sea waters. The plant was able to survive without apparent injury in a cane-sugar solution containing 1.2 gram-molecules per liter. The greater or less proportion of the cells were able to live in weaker or stronger solutions, but their osmotic activity was somewhat disturbed. Plants were found to be fatally affected within an hour by solutions of common salt in all concentrations, and in a solution isotonic with sea water were destroyed within half an hour. A series of synthetic sea waters was prepared and tested, death occurring within half an hour in those solutions containing the amount of sodium chlorid present in the natural sea water at the location of the laboratory. When magnesium salts were added no marked change was to be seen. Upon the addition of a trace of calcium sulphate the time of survival was extended to about 2 hours, and upon the addition of potassium compounds the plants lived for about 24 hours. Although the synthetic solutions were isotonic with natural sea water, the artificial mixture was less saline to the taste than the former. Upon adding salt until about equal salinity was obtained, the artificial solution was found to be capable of supporting an apparently normal existence of the alga for 8 days. It appears from these experiments that not only the actual amount of substances dissolved, but the form in which they exist is of importance.

Water as a plant food, W. H. Jordan (*Drainage Jour., 24 (1902), No. 3, pp. 53–56*).—A popular discussion of this subject.

METEOROLOGY—CLIMATOLOGY.

Annual summary of meteorological observations in the United States, 1901 (*Mo. Weather Rev., 29 (1901), No. 13, pp. IX+591–613, charts 7*).—This number gives a table of contents, list of corrections, additions, and changes, and an index for volume 29; and a summary of observations on temperature, pressure, precipitation, wind movement, cloudiness, and other meteorological phenomena "based essentially upon data received from about 162 regular stations, 33 regular Canadian stations, and such voluntary stations as have forwarded their annual summaries in time."

Monthly Weather Review (*Mo. Weather Rev., 30 (1902), Nos. 1, pp. 1–60, charts 10; 2, pp. 61–108, figs. 5, charts 10; 3, pp. 109–156, figs. 7, charts 9*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of January, February, and March, 1902, recent papers bearing on meteorology, etc., these numbers contain the following articles and notes:

No. 1.—Special contributions on Earthquakes, Clouds, and Gales at Port Carolina, South Australia, by G. H. Styles; January Gales from the Great Lakes to the Maritime Provinces, by B. C. Webber; Abstract of a Comparison of the Minimum Temperatures Recorded at the United States Weather Bureau and the Forest Park Meteorological Observatories, St. Louis, Mo., for the year 1891, by W. H. Hammon and

F. W. Duenckel; Studies on the Statics and Kinematics of the Atmosphere in the United States—I, A new Barometric System for the United States, Canada, and the West Indies, by F. H. Bigelow; and the term Indian Summer, by A. Matthews; and notes and extracts on yellow snow in Michigan, Bartholomew's physical atlas—meteorology, the hurricanes of the far east, the Weather Bureau in the West Indies, fresh light on the Antarctic, a history of meteorological work in India, pamphlets relative to Wetterschiessen, the Third International Congress on Hail Shooting, general report on hail shooting presented to the congress at Lyons (by J. R. Plumandon), and Weather Bureau men as instructors and lecturers.

No. 2.—Special contributions on The term Indian Summer, by A. Matthews; and Studies on the Statics and Kinematics of the Atmosphere in the United States—II, Method of Observing and Discussing the Motions of the Atmosphere (illus.), by F. H. Bigelow.

No. 3.—Special contributions on Studies on the Statics and Kinematics of the Atmosphere in the United States—III, The Observed Circulation of the Atmosphere in the High and Low Areas (illus.), by F. H. Bigelow; Fog and Frost Formation, by D. Cuthbertson; and Some Experiments in Atmidometry (illus.), by J. S. Stevens; and notes and extracts on prize for pressure anemometer, hourly temperatures for Baltimore, Md. (illus.), meteorology and the schools, Pernter's meteorological optics, Second Mexican Congress of Meteorology, graduate study at Washington, the variation of the diurnal range of temperature with the latitude and locality, the "snow country" of central New York, and National Bureau of Standards.

Summaries of temperature, rainfall, and sunshine, E. F. Ladd (*North Dakota Sta. Rpt. 1901, pp. 11–13*).—Tables give the maximum, minimum, and average monthly temperature, monthly rainfall, and sunshine for the year 1901.

Meteorology of 1901, A. Buchan (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 14 (1902), pp. 371–377*).—A table gives the wind, mean pressure, temperature, rainfall, cloud, and sunshine for 1901, as compared with the average of the 45 years from 1856 to 1900 for all Scotland. The general features of the weather of each month of 1901 and the effect of the season on the growth of crops, especially wheat, barley, oats, potatoes, and turnips, are briefly discussed.

Meteorology, 1901-2, G. Ginestous (*Bul. Dir. Agr. et Com., 7 (1902), No. 23, pp. 237–241*).—A summary of observations on temperature and rainfall during December, January, and February.

Report on the meteorological observations made in the society's gardens at Chiswick, 1901, E. Mawley (*Jour. Roy. Hort. Soc. [London], 26 (1902), No. 4, pp. 802–809, figs. 3*).—Summaries for temperature and rainfall of each month are given.

A study of the climate of Tunis, G. Ginestous (*Bul. Dir. Agr. et Com., 7 (1902), No. 23, pp. 210–232, figs. 7, charts 3*).—A summary of observations on temperature and pressure, wind, frost, humidity, evaporation, and casual phenomena during the months of March, April, and May.

The Third International Hail Protection Congress, Lyons, 1901, J. Vandervaeren (*Rev. Gén. Agron. [Louvain], 10 (1901), No. 12, pp. 529–544, pl. 1; 11 (1902), No. 1–2, pp. 1–30*).—This is the report of the official representative of the French Ministry of Agriculture delegated to attend the congress and report its proceedings. It includes a summary of the proceedings and of the reports of the official representatives of the various countries participating in the congress, the resolutions adopted, and the author's conclusions from the proceedings of the congress. The principal features of the resolutions adopted have already been noted (E. S. R., 13, p. 626). In concluding his report, the author states that "if the reports, discussions, and conclusions of the congress at Lyons have not definitely solved the problem, neither have they produced a generally unfavorable impression regarding the firing, nor have they served as a prelude to the funeral of the method, as some have thought; they encouraged, on the contrary, the most legitimate hopes of success in the struggle undertaken for protection against hail."

The mechanism and causation of hot waves, H. M. WATTS (*Jour. Franklin Inst., 153 (1902), No. 4, pp. 285–293, figs. 3*).

SOILS.

Sixth annual report for the year 1900 of the Agricultural Experiment Station of Ploti (*Six. Rap. An. Sta. Expt. Agron. Ploty, 1900, pp. XXIV + 234, pls. 2, dgms. 3*).—The report consists of separate reports of the experiment field, the chemical laboratory, the meteorological station, the vineyard, and of vegetation experiments, together with introductory articles by the founder and the editor-in-chief. The report is in the Russian language, but contains a French résumé of the work in the chemical laboratory (p. 5). (See also Field crops, p. 29.)

Report of the experiment field.—In experiments on the dependence of the temperature of the soil on the plant covering, one part of a small plat was planted to oats, while the other was left without a crop. Observations were made with 4 thermometers, of which 2 were placed under the plant on the surface of the soil and at a depth of 0.1 meter respectively, while the other 2 were similarly placed on the part without a crop. The experiments showed that the difference in temperature on the surface of the soil reached up to 15.4° C. and at a depth of 0.1 up to 7°.

In a study of the humidity of the soil in dependence on the kinds of fallow, the depth of plowing, and the plant covering determinations of humidity were made, as in previous years, on the green fertilized fallow of the four-course rotation, plowed to a depth of 7 in., on the black April and May fallows of the nine-course rotation, plowed to a depth of 7 and 10.5 in., and on an unplowed field. The results are summed up as follows: (1) The black fallow stands first in the matter of accumulating moisture, fields plowed in April next, while the fields plowed in May occupy the last place; (2) the loss of moisture during the winter, spring, and summer is greater on black fallow than on ground plowed in April or May; (3) the general amount of water stored up in the fields plowed in April was nearly the same as in those plowed in the fall, but as regards the yield the former exceed the latter; (4) deep plowing gave better results than shallow, except during the summer, when the influence of the plants reverses the conditions.

Vegetation experiments.—The comparative fertility of the different soil horizons was studied by taking samples of soil on which barley had grown to 3 different depths, from the surface to 10.5 in., 10.5 in. to 17.5 in., 17.5 in. to 24.5 in. Analysis showed that the soil at the lowest depth (subarable soil) was richer than the arable layer in all constituents except phosphoric acid. In the intermediate layer or horizon the amounts of potash, lime, and magnesia were larger than in the upper or arable layer, while the amounts of humus, nitrogen, and phosphoric acid were less. In pot experiments with the soil of these three horizons the yield of oats on the soil of the arable layer was much larger than in the other cases. This is explained by the fact that only the upper layer of soil has a sufficient supply of assimilable phosphoric acid. Assimilable nitrogen is distributed throughout the soil layers, and deep-rooted plants can secure all of this constituent which they require, even when the surface soil is somewhat deficient in nitrogen.

In the experiments with oats in the arable soil layer described above the amount of water evaporated daily from the soil receiving different fertilizers was determined throughout the whole period of vegetation. The results show that large crops were accompanied by larger absolute losses of water, although the relative amounts of water evaporated decreased. The increase of the yield in these experiments depended on the nitrogen, i. e., on the element present in minimum. Hence the addition of nitrogen singly or in mixtures in almost all cases was accompanied by a decrease of the loss of water per unit of dry matter.

Report of the meteorological station.—Observations were made on the rainfall, evaporation, and humidity of the soil; on the temperature of the air and the soil; on the cloudiness, sun's radiation, and the intensity of the sun's rays; on the pressure of the air and on the wind, etc.

Report on the Ploti vineyard.—The work here described relates to wine making as well as to grape culture.

The development of a soil survey, F. K. CAMERON (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 35–41*).—This article discusses the development and the general features of the present method of conducting the soil surveys of the Bureau of Soils of this Department. It is stated that in general the main feature of the soil classification adopted is a physical one, but geological, chemical, and climatic conditions are also taken into consideration in the classification or establishment of types for particular areas. The soils are mapped in the field as the survey progresses from day to day on base maps in which the conventional scale of 1 in. to a mile is adopted. The observations in the field are supplemented by laboratory studies. The main advantages claimed for the system of classification are completeness and flexibility, permitting a ready correlation of the soil types of one area with those of another.

"The most striking practical result of the soil survey is the impetus which it has given to the idea of the adaptation of special crops to special soils," the prevailing idea in this line of soil investigation being to determine the soil areas adapted to particular crops, rather than the adaptation of the soil by the addition of fertilizers or by other means to some crop often selected without reference to its adaptability to the soil.

The soil as an economic and social factor, F. K. CAMERON (*Pop. Sci. Mo., 60* (*1902*), *No. 6, pp. 539–550*).

The investigation of cultivated soils, O. VIBRANS (*Bl. Zuckerrübenbau, 9* (*1902*), *pp. 25–31*).—A general discussion of methods and results.

Agricultural soil studies, H. DUBBERS (*Jour. Landw., 50* (*1902*), *No. 1, pp. 7–14*).—A criticism of the practical usefulness of soil maps and charts based on geological classification, and suggestions as to their improvement in this respect by combining the agricultural with the geological classification. A system of nomenclature with convenient abbreviations for use on maps and charts is proposed.

Studies on cultivated soil, T. SCHLOESING (*Compt. Rend. Acad. Sci., Paris, 134* (*1902*), *No. 11, pp. 631–635*).—The author analyzed separately the particles which subsided after periods of 1 minute, 5 minutes, 1 hour, 5 hours, and 24 hours, in water in which soil had been shaken, as well as all the particles visible under the microscope which separated out from the dilute solution from the previous separations after several months' standing. It was found that the content of phosphoric acid and ferric oxid rapidly increased with the fineness of the particles, the ratio between the two remaining almost constant. The finest silt particles and the colloidal clay contained almost the same amounts of iron, ferric oxid, and phosphoric acid.

Soils of North Dakota, E. F. LADD (*North Dakota Sta. Rpt. 1901, pp. 22–29*).—This is a compilation of average analyses of typical soils and subsoils of the State examined during the past 12 years.

Soil moisture study, A. M. TEN EYCK (*North Dakota Sta. Rpt. 1901, pp. 104, 105*).—Determinations of the moisture in soils under different methods of treatment were made at seeding time (May 8) and at harvest time (August 8). At seeding time the moisture content of the soil to a depth of 2 feet was nearly uniform in 5 plats under observation. At harvest time summer fallowed land showed 24.4 per cent of moisture in 3 ft. of soil, corn land 24.2 per cent, and wheat land 10.2, and 11.2 per cent in plats fall and spring plowed, respectively.

Report on the clays of Maryland, H. Ries (*Maryland Geol. Survey, 4 (1902), pp. 205–505, pls. 51, figs. 30*).

On the plasticity of clay, P. Rohland (*Ztschr. Anorgan. Chem., 31 (1902), No. 1, pp. 158–160*).—The plasticity of clay is ascribed to the constituents which form colloidal solutions with water.

Mineral in Jamaica soils, E. Leuscher (*Ztschr. Oeffentl. Chem., 8 (1902), pp. 28, 29*).—An examination of black balls found in the clay soils and subsoils of Jamaica are reported, which show them to contain 14.75 per cent of manganese and 13.6 per cent of iron.

The Jurassic region of Belgium, A. Henry (*Jour. Soc. Cent. Agr. Belg., 49 (1902), Nos. 2, pp. 90, 91; 3, pp. 120–122*).—This is a brief account of the geological, soil, climatic, and agricultural conditions of this region.

The nature, value, and utilization of alkali lands, E. W. Hilgard (*Agr. Ledger, 1901, No. 4 (Min. and Met. Ser., No: 17), pp. 41–69*).—This is a review of California Station Bulletin 128 (E. S. R., 12, p. 221).

The effect of lime on the insoluble phosphates of the soil, W. F. Sutherst (*Chem. News, 85 (1902), No. 2210, p. 157; Agr. Gaz. [London], 55 (1902), No. 1474, p. 204*).—By mixing various iron and aluminium phosphates with twice their weight of slaked lime in the presence of water the following results were obtained: Protophosphate of iron, which originally contained only 2.47 per cent of phosphoric acid soluble in citric acid by Dyer's method, showed 19.55 per cent soluble after 24 hours' action of the lime, 22.15 per cent after 48 hours, and 22.26 per cent after 72 hours. Perphosphate of iron, originally containing 2.75 per cent of phosphoric acid soluble in citric acid, showed 21.96 per cent soluble after 24 hours, 22.41 per cent after 48 hours, and 22.45 per cent after 72 hours. Aluminium phosphate, containing originally 3.2 per cent of phosphoric acid soluble in citric acid, showed 18.45 per cent soluble after 24 hours, 19.88 per cent after 48 hours, and 20.65 per cent after 72 hours. "It is essential that the lime should be in the form of hydrate, the carbonate being of no value whatever."

What is the minimum content of lime in soils which respond to liming? Lilienthal (*Deut. Landw. Presse, 29 (1902), Nos. 22, pp. 183, 184; 23, pp. 195, 196; 25, pp. 210, 211*).—Comparative tests of lime, marl, etc., on a number of different kinds of soil are reported.

What practical deductions can the agriculturist draw from a knowledge of the calcium carbonate content of soils? M. Passon (*Deut. Landw. Presse, 29 (1902), No. 39, pp. 336, 337*).—The author reviews a large number of experiments with fertilizers by different investigators to show that the action of different fertilizing materials is very largely dependent upon the lime content, especially assimilable lime, of the soil.

Irish soils, including the peat, G. H. Kinahan (*Farmers' Gaz., 60 (1901), No. 51, pp. 922; 61 (1902), Nos. 4, p. 51; 5, p. 69; 7, p. 101; 10, pp. 156, 157; 12, p. 196; 13, p. 212*).—A criticism of the publications of the Department of Agriculture and Technical Instruction of Ireland relating to soils, and a plea for the Geological Survey to undertake the study and mapping of soils, with suggestions as to how this should be done. The use of commercial fertilizers and of indigenous fertilizing materials, the soil-forming agencies, and the occurrence and character of the peat bogs are discussed.

Causes of sterility in peat soils, J. Dumont (*Compt. Rend. Acad. Sci. Paris, 133 (1901), pp. 1243–1246; abs. in Jour. Chem. Soc. [London], 82 (1902), No. 472, II, p. 169*).—"Whilst the nitrogen present in a sample of peaty soil nitrified extremely slowly, it was found that ammonium sulphate added to the same soil was quickly nitrified, indicating that the soil is favorable to nitrification, but not to the production of ammonia from organic nitrogen. Further experiments showed that the different samples of peaty soils examined contained very little potassium, and that the addition of potassium carbonate to one of them gave rise to the production of ammonia. The best results were obtained by adding 2 per cent of potassium carbonate, but 1 per cent had a very considerable effect. The conclusion is drawn that potassium carbonate ought to be applied to peat land."

Soil temperatures at Flahult Moor Experiment Station, Sweden, 1897-1901, H. von Feilitzen (*Tidskr. Svenska Mosskult. Förening, 16 (1902), No. 2, pp. 141-151.*)—Temperature measurements were made at depths of 20, 40, and 60 cm. on low and high moors, under various conditions of culture, some plats being sand-covered, others mixed with sand, drained by ditching to different depths, etc. The temperature of the soil was found to increase on the average about 1° C., through application of sand on the moor, and more with increasing quantities applied. The investigations furnish decisive evidence that moor soils may be rendered considerably warmer by applications of soil amendments. As a result the danger of frost is decreased, the soil can be worked and planted to crops earlier in the spring, and the crops grown therefore develop more rapidly.—F. W. WOLL.

The composition of soil samples from marsh land, O. von Czadek (*Ztschr. Landw. Versuchw. Oesterr., 5 (1902), No. 1, pp. 29-33, pl. 1; abs. in Chem. Centbl., 1902, I, No. 9, p. 539*).—A number of analyses of soil and subsoil are reported. These were made in connection with an attempt to improve the soils by the use of sewage from Vienna. The soils are generally fairly well supplied with plant foods, and their unproductiveness in many cases is attributed to unfavorable climatic conditions.

Results of vegetation experiments on marsh soils, B. Tacke (*Mitt. Deut. Landw. Gesell., 17 (1902), Nos. 18, pp. 99, 100; 19, pp. 101, 102*).—These experiments were made in zinc pots containing about 19 kg. of the fresh soils. The two soils used contained only 8.24 and 8.99 per cent of organic and volatile matter, respectively. The results show that they were benefited by applications of lime and phosphoric acid, but apparently their greatest need was nitrogen. There seemed to be little demand for potash.

Soil tests and variety tests, E. W. Hilgard (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 89-94*).—A paper discussing the methods of making soil and variety tests.

Nitrification in different soils, W. A. Withers and G. S. Fraps (*Jour. Amer. Chem. Soc., 24 (1902), No. 6, pp. 528-534*).—In continuation of previous studies on the rate of nitrification of different nitrogenous fertilizing materials (E. S. R., 13, p. 122), the authors studied the rate of nitrification of ammonium sulphate and cotton-seed meal in 11 soils obtained from different parts of the country and including sandy soil, light loam, heavy clay, black garden soil, etc., some of them being acid. The results are summarized as follows:

"(1) Addition of calcium carbonate invariably accelerates the nitrification of cotton-seed meal and ammonium sulphate, especially the latter.

"(2) In some soils a greater percentage of the nitrogen in ammonium sulphate is nitrified than that in cotton-seed meal, and in other soils the contrary is the case, even in the presence of calcium carbonate.

"(3) The factors which produce this result are probably as follows: (1) The presence of the ammonium sulphate diminishes the activity of the nitrifying organisms; (2) the acids produced also hinder them; (3) different soils contain different classes of organisms, some of which nitrify organic in preference to ammoniacal nitrogen.

"(4) We have found no evidence on record that organisms which nitrify organic nitrogen directly do not exist. The fact that they have not been isolated by present methods may be due to their elimination by the use of ammonium salts, on which they can not feed, in the nutritive medium.

"(5) Liming acid soils is favorable to nitrification.

"(6) Continuous application of ammonium sulphate to a soil previously limed increases its power of nitrifying ammonium sulphate."

Nitrogen of humus, A. Dojarenko (*Landw. Vers. Stat., 56 (1902), No. 4, pp. 311-320*).—Total nitrogen and nitrogen in form of amids, ammonia, and amido acids are reported in humus derived from black humus soil and sandy and loam black soils. The percentage of total nitrogen in the humus varied from 2.74 to 4.59, from one-half to two-thirds of the nitrogen being in form of amido acids, a few hundredths per cent in form of ammonia, and the rest as amids.

Humus and soil fertility, H. Snyder (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 62–65*).—The value of humus for conserving moisture in the soil is discussed, and data for determinations of moisture at different dates on soils containing varying amounts of humus are reported. These show that "whenever the moisture content of the soil reached a comparatively low point the plat which contained the larger amount of humus and upon which the crops had been rotated always showed a higher per cent of water than the plat which had been under continuous wheat cultivation."

The chemical rôle of earthworms, H. d'Anchald (*Jour. Agr. Prat., n. ser., 3 (1902), No. 22, pp. 700, 701*).—This is a summary of investigations by Dusserre,[1] which show that the excreta of earthworms contains more ammoniacal and nitric nitrogen and undergoes nitrification more rapidly than the original soil, that solubility of the phosphoric acid is increased in the soil by passing through the worms while that of the potash is not affected, and that there is a larger percentage of carbonate of lime in the excreta than in the soil.

The Campbell method of soil culture, H. M. Cottrell (*Industrialist, 28 (1902), No. 25, pp. 375–384, figs. 4*).—The results of several years' tests of this method on the station grounds and on a farm in western Kansas are said to show it to be an effective means of conserving moisture in the soil in times of drought.

Interior land changes (*Queensland Agr. Jour., 10 (1902), No. 4, pp. 277–282, figs. 5*).—An account is given of the changes which have been brought about in various parts of Australia by the shifting of sands during windy seasons. Various sand dunes are described, and for the prevention of their encroachment the author recommends the planting of wind-breaks wherever possible and the binding of the sands by planting various plants which are adapted to growth in such regions.

FERTILIZERS.

Organic nitrogen availability of fertilizing materials, C. H. Jones and B. O. White (*Vermont Sta. Rpt. 1901, pp. 219–221*).—Determinations by the alkaline-permanganate method of availability of nitrogen in 61 samples of organic nitrogenous materials obtained from various sources are reported. The results confirm those of previous experiments (E. S. R., 12, p. 224) in showing "that the method is capable of making sharp and true distinctions between most nitrogenous materials used for fertilizing purposes, classifying them as good, medium, or poor. The chief material to which the method does injustice is cotton-seed meal, which has a recognized high availability, but which this treatment places in the medium to poor class. This eccentricity is due to the relatively large amount of nonnitrogenous organic matter contained in the cotton seed." It is recommended that fertilizers showing an availability of less than 50 per cent by this method be treated by the pepsin digestion process, "which does full justice to cotton-seed meal."

Observations on the number and depth of distribution of the roots of different plants under various systems of manuring the soil, C. von Seelhorst (*Jour. Landw., 50 (1902), No. 1, pp. 91–104*).—From the results of a number of experiments which are here reported the conclusion is drawn that plants when liberally fertilized not only have a larger root system, but these roots descend deeper into the soil, and are thus able to better withstand drought.

Manure from steers and swine, W. A. Henry (*Breeders' Gaz., 41 (1902), No. 8, pp. 367, 368*).—The percentage of nitrogen and ash voided as excrement or secured as animal produce with different farm animals is tabulated.

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[1] Ann. Agr. Suisse, 1902, No. 2.

On the importance of recent bacteriological investigations for the question of rational utilization of the nitrogen content of farm-yard manure, H. G. SÖDERBAUM (*K. Landt. Akad. Handl. Tidskr., 40 (1901), No. 4, pp. 272–284*).

The utilization of night soil as manure, R. S. JOSHI (*Dept. Land Records and Agr., Central Provinces [India], Bul. 5, pp. 6*).—The advantages of the method of dumping into shallow trenches with well pulverized bottoms from tank carts are explained.

On minerals occurring in Australian bat guano, R. W. E. MACIVOR (*Chem. News, 85 (1902), Nos. 2212, pp. 181, 182; 2215, p. 217*).—Analyses of phosphatic crystals found embedded in bat guano deposits are reported.

Green manuring on sugar estates (*Jour. Jamaica Agr. Soc., 6 (1902), No. 3, pp. 99, 100*).—The general practice of green manuring to maintain the fertility of sugar-cane lands as is the case in Barbados is recommended.

The plowing under of green manures for winter plantings, CAUSEMANN (*Deut. Landw. Presse, 29 (1902), No. 27, pp. 232, 233*).

Experiments to test the value of 40 per cent potash salt as compared with kainit, M. MAERCKER and W. SCHNEIDEWIND (*Arb. Deut. Landw. Gesell., 1901, No. 56, pp. 240; 1902, No. 67, pp. 170; abs. in Chem. Ztg., 26 (1902), No. 16, Repert., p. 53*).—These are detailed accounts of cooperative experiments during 2 years by a number of experiment stations in different parts of Germany to test the value of this new potash fertilizer. The 40 per cent salt is prepared from (1) carnallit or hartsalz by concentration, (2) sylvinit, (3) a mixture of crude, low-grade salts with potassium chlorid. The average composition of the product as put on the market is stated to be as follows: Moisture 3.6 per cent, potassium chlorid 62.5 per cent, potassium sulphate 1.9 per cent, magnesium sulphate 4.2 per cent, magnesium chlorid 2.1 per cent, sodium chlorid 20.2 per cent, gypsum 2.4 per cent, insoluble matter 3.1 per cent. The average percentage of potash is 40.53. In these experiments it was found that kainit gave better results than the 40 per cent salt on cereals on both light and heavy soils, and there was no appreciable injurious effect on the mechanical condition of the soil. In case of potatoes, however, the yields both of total crop and of starch were larger with the 40 per cent salt than with kainit. The highly bred varieties of sugar beets, unlike potatoes, appear to be very indifferent to mineral salts. The sugar content was increased by the application of the potash salts. The 40 per cent salt and the kainit were about equally effective. The 40 per cent salt may, however, be preferable for this crop, because it can be applied in large amounts without danger of injuriously affecting the mechanical condition of the soil.

Field experiments with ammonium sulphate in the Province of Posen, KLOEPFER (*Fühling's Landw. Ztg., 51 (1902), Nos. 6, pp. 193–197; 7, pp. 231–233*).—Experiments on beets and potatoes with barnyard manure, and superphosphate with ammonium sulphate and sodium nitrate singly and combined are reported. There was a very close agreement in the results obtained from the use of the two sources of nitrogen.

Fertilizer experiments on moor soils, H. VON FEILITZEN (*Jour. Landw., 50 (1902), No. 1, pp. 77–90, pls. 3*).—A brief account of experiments with potassic, phosphatic, and nitrogenous fertilizers at Flahult during 1887–1899. The soils were generally benefited by applications of potash and phosphoric acid, but responded most favorably to applications of nitrogen.

Phosphatic fertilizers for moor soils, K. C. LASSEN (*Ugeskr. Landm., 47 (1902), No. 6, pp. 70–72*).

The better utilization of the nitrogen supply of the soil and air as a result of liberal applications of phosphoric acid, F. GIERSBERG (*Deut. Landw. Presse, 29 (1902), No. 37, p. 318, fig. 1*).—Applications of from 200 to 800 kg. per hectare (178.51

to 714.04 lbs. per acre) of Thomas slag resulted in an increased total yield of wheat, potatoes, alfalfa, hay, and also an increase in total amount of nitrogenous matter.

The natural phosphates and their use in agriculture, MAIZIÈRES (*L'Engrais, 17 (1902), No. 13, pp. 303, 304*).—This article briefly reviews experiments with untreated phosphates by various investigators on different kinds of soils. The author considers the results inconclusive except as regards the favorable action of such phosphates on peaty soils and sandy plains.

Slags and superphosphates—results of 10 years' experiments, E. C. PRADEL (*Sta. Agron. Nancy, Bul. 4, 1901, pp. 15–24*).—The principal conclusion from these experiments is that slags are preferable to superphosphates on all soils containing less than 3 per cent of assimilable lime.

The agricultural value of Martin slag, A. PETERMANN (*Jour. Agr. Prat., n. ser., 3 (1902), No. 17, pp. 535, 536*).—This is a basic slag similar to Thomas slag. Analyses of 4 samples reported in this article show percentages of phosphoric acid soluble in mineral acids varying from 2.12 to 10.8; of free lime from 0.19 to 3.7; soluble silica from 8.21 to 25.74. The solubility of the fine meal in Wagner's reagent varied from 76 to 100 per cent. In pot experiments with wheat using amounts of the two phosphates furnishing equal amounts of phosphoric acid the Martin slag was fully as effective as Thomas slag.

Discovery of mineral phosphates in South Australia (*Jour. Agr. and Ind. South Australia, 5 (1902), No. 8, pp. 670, 671*).—This is an extract from a report by H. Y. L. Brown to the minister of mines of South Australia announcing the discovery of phosphate deposits on Northern Yorke's Peninsula. The investigations made indicate "that the quantity of rock containing a sufficient percentage of phosphate of lime to render it of commercial value is very large, and the configuration of the country is most favorable to the opening of quarries, whereby the rock can be raised cheaply and expeditiously, and shipments averaging 70 per cent of tricalcic phosphate and less than 6 per cent of iron and alumina could be easily selected."

Note on free acid in superphosphate, J. OSTERSETZER (*Chem. News, 85 (1902), No. 2213, pp. 195, 196*).—A brief note on the appearance of intermediate tints between opalescence and complete neutrality when titrating superphosphates with half-normal or tenth-normal sodium hydroxid using various indicators.

Buying and using commercial fertilizers, L. A. CLINTON (*New York Cornell Sta. Bul. 201, pp. 179–195, figs. 6*).—This bulletin discusses methods of calculating the commercial value of fertilizers and the economy of buying unmixed fertilizing materials and mixing them on the farm, and reports the results of comparative tests of acid phosphate (dissolved rock phosphate), basic slag, floats, and dissolved boneblack on clover, Canada field peas, rape, radishes, oats, barley, and parsnips grown in boxes filled with quartz sand. The acid phosphate used contained 12.42 per cent of soluble phosphoric acid, 17.45 per cent available, and 18.36 per cent total phosphoric acid. The corresponding percentages for the dissolved boneblack were 10.71, 14.61, and 16.25. The basic slag contained 15.94 per cent of total phosphoric acid, the floats 31.37 per cent. The best returns were secured with acid phosphate and dissolved boneblack in nearly every case. The two were about equally effective on clover and peas. These crops were apparently able to make some use of the basic slag, but the product was only about half of that secured with the soluble phosphates. The untreated phosphate (floats) was apparently without effect on the clover and peas. Rape made best growth with floats, radishes with acid phosphate, although the yield of the latter was increased by the floats and basic slag. "The results seem to show that the members of the Cruciferæ order are able to extract food from the insoluble forms of phosphoric acid." The largest yields of oats and barley were obtained with the soluble phosphates, the oats making a better growth with basic slag and floats than the barley. Parsnips gave better results with dissolved boneblack and apparently made little use of basic slag and none of floats.

The purchase of artificial manures (*Jour. Bd. Agr.* [*London*], *8* (*1902*), *No. 4*, *pp. 447–458*).—A general discussion of the sources and valuation of fertilizing materials.

Fertilizers. I, Sources and composition, B. H. Hite (*West Virginia Sta. Bul. 80, pp. 271–351*).—A general treatise on this subject.

Commercial fertilizers, H. A. Houston and W. J. Jones (*Purdue Univ. Spec. Bul. 1902, Apr., pp. 35*).—During the year 1901, 592 samples of fertilizers were collected and analyzed. The results are reported in detail with the text of the Indiana fertilizer law which went into effect March 11, 1901, and a list of all fertilizers that were legally on sale in Indiana April 1, 1902.

Analyses of commercial fertilizers and Paris green, W. C. Stubbs (*Louisiana Sta. Bul. 65, pp. 629–774*).—This is an account of fertilizer inspection in Louisiana during the season of 1900–1901, involving analyses of 2,510 samples of fertilizers and fertilizing materials. The bulletin also contains a discussion of the nature and sources of materials furnishing nitrogen, phosphoric acid, and potash; the valuation of fertilizers; the purposes and methods of inspection, with the text of the fertilizer law; and reports analyses of 140 samples of Paris green inspected during the season.

Analyses of commercial fertilizers, J. L. Hills, C. H. Jones, and B. O. White (*Vermont Sta. Bul. 92, pp. 55–76*).—Analyses and valuation of samples of 40 brands of fertilizers are reported, with a brief discussion of the commercial valuation and agricultural value of fertilizers, and the average composition of the leading brands sold in the State during the last 5 years.

Commercial fertilizers, J. H. Stewart and B. H. Hite (*West Virginia Sta. Bul. 79, pp. 233–267*).—Analyses and valuations of 262 samples of fertilizing materials examined during the year ended December 31, 1901.

The new fertilizer law, J. H. Stewart (*West Virginia Sta. Bul. 77, pp. 199–212*).—The text of the West Virginia fertilizer law, which took effect May 2, 1901, with comments and explanations.

Regulations concerning the sale of artificial fertilizers, feeding stuffs, and seeds in Finland, G. Grotenfelt (*Landbr. Styr. Meddel., No. 36, 1902, pp. 109*).

Artificial manures in Russia (*Jour. Soc. Chem. Ind., 21* (*1902*), *No. 7, p. 511*).—The extent of the use of fertilizers in Russia is discussed.

Boiler scale, E. F. Ladd (*North Dakota Sta. Rpt. 1901, p. 21*).—Analyses of 2 samples of boiler scale are reported.

FIELD CROPS.

Report on field crops, J. H. Shepperd and A. M. Ten Eyck (*North Dakota Sta. Rpt. 1901, pp. 44–89, 98–104, 106, 107, fig. 1*).—A general description is given of the work of the agricultural department for 1901, and the results obtained in the different experiments are presented in tables and briefly considered. The work for this season was largely in continuation of experiments previously reported (E. S. R., 13, p. 336).

Wheat.—A field trial was made of 38 varieties, of which 17 were macaroni wheats. Aronautka, a macaroni variety, headed the list with a yield of 34 bu. per acre. Among the blue stem varieties American, closely seconded by Selected Haynes, stood first in yield. Among the Fife varieties Minnesota No. 285 stood first. The average yield for 8 years of blue stem varieties was 24.9 and of Fife varieties 24 bu. per acre. The average yield of the 5 leading varieties in each class in 1901 was 33.1 bu. per acre for macaroni wheats, 29.7 for blue stem varieties, and 27.6 for Fife varieties. For the 3 seasons that macaroni varieties have been grown at the station they have twice given better yields than the other wheats. In 1901 sowing at the rate of

5½ pks. of seed per acre gave the best yield, but the average yields for 4 years are in favor of 6 and 7 pks. of seed per acre.

Experiments in plowing for wheat begun in previous years were continued. As indicated by the average results fall plowing gave better yields than spring plowing. In some seasons spring plowing gave the best returns. For 5 years, including the season of 1901, fall plowing from 3 to 4 in. deep was compared with plowing from 6 to 7 in. deep. The results were in favor of deep plowing, but the difference in the average yields was only 0.6 of a bushel per acre. The outcome of a similar experiment carried on for 3 years with spring plowing also favored the deeper plowing, the difference in the average yields per acre in this case being 0.9 of a bushel. A comparison for 4 years of disk and moldboard plowing either in the fall or spring gave results in favor of the moldboard plowing. Trials with different makes of disk plows are reported in this connection.

Oats.—Of 26 varieties grown in 1901, Minnesota No. 202, Silver Mine, Early Gothland, Siberian White, and Bow of Promise, given in the order of productiveness, were the leading sorts. The yield of Minnesota No. 202, tested at this station for the first time, was 67.1 bu. per acre, while the yield of the other 4 varieties ranged from 60.3 to 60.9 bu. Early Gothland, which has proved a good yielder, and Siberian White and Bow of Promise produced a grain of fine appearance and quality.

Barley.—Fifteen varieties were grown this season. The best yielding varieties were Mandscheuri, Manshury, Minnesota No. 87, Minnesota No. 105, and Minnesota No. 32, producing 45.1, 42.1, 40.4, 40.3, and 40 bu. per acre, respectively. Mandscheuri and Manshury barley are considered identical. In trials carried on for 8 years, Manshury 6-rowed barley has proved to be one of the best yielding varieties.

Emmer.—Emmer from Dakota-grown seed yielded 48.7 bu. per acre, and from seed obtained from this Department 56 bu. A history of this grain is given, reference is made to its being erroneously called spelt, and its yielding capacity and feeding value are compared with barley, oats, and wheat.

Flax.—In growing flax for comparison it was estimated that the crop of common flax was at least one-fourth better than Argentine flax. The thinnest seeding, 1½ pks. per acre, produced the largest crop of seed and straw.

Potatoes.—A field trial of 21 varieties was conducted. The leading varieties were Sunlight, Daughter of Rose, Million Dollar, Rose of the North, and Mark Hanna, yielding 207.5, 199.2, 181.1, 174.2, and 171.6 bu. per acre, respectively. Early Andes and Rural New Yorker No. 2 have been grown at the station for several years and improved by selection. The results, with descriptive notes on all the varieties grown, are tabulated.

Brome grass.—A series of brief reports on the value of brome grass from farmers throughout the State is given, and the culture of brome grass discussed.

Results at the Edgeley substation.—A description of the station and its organization is given, and the results obtained in 1901 are briefly reported. Shallow plowing for wheat yielded 55 per cent more than deep plowing. A test of Aronautka macaroni wheat resulted in a yield of 9 bu. per acre. Harrowing wheat 3 times after it had begun its growth resulted in a failure of the crop. Culture tests with emmer, oats, flax, corn, millet, Kafir corn, Canadian field peas, Japanese barnyard grass, brome grass, Turkestan alfalfa, rape, potatoes, sugar beets, and artichokes are briefly recorded. A study of the distribution of the roots of corn between two hills 3½ ft. apart showed that some of the roots had attained a length of 5 ft., extending from hill to hill and from 2 to 3 ft. into the soil.

Report of the botanist, H. L. BOLLEY (*North Dakota Sta. Rpt. 1901, pp. 30–44*).—*Wheat.*—These experiments are in continuation of work in progress for 4 years and previously described (E. S. R., 13, p. 345). This season the results of tests in the selection of wheat from the individual heads were inconclusive. The general results of the tests for the 4 years show that perfect grains of large size and greatest weight produce better plants than perfect grains of smaller size and weight even if the grains came from the same head. The importance of the quality of the seed and of a proper and even depth of seeding is also indicated by the results. It is concluded that the depth of seeding should be about 1 in. The results of selecting wheat from the bin corresponded closely to those of the previous season.

The growth of wheat from mature and immature seed showed that of weak and immature grains, although giving a high percentage of growth in the germinator, over 50 per cent failed to give good results under field conditions. The seed used represented three degrees of maturity, namely, grains harvested when in the milk stage, grains harvested in a soft doughy stage, and thoroughly mature grains. The mature seed produced the most stools and the heaviest yield.

Germination tests of wheat injured by moisture after maturity with brief descriptive notes on each sample are reported in a table. In connection with this work it was noticed that in a dry soil soft seeds came up quicker than hard seeds, but that when the soil was moistened the soft seeds decayed rapidly while the hard seeds survived.

The growth of wheat in the field was compared with laboratory germination tests, and these results are also given in tabular form. On an average for the 18 samples tested, the difference between the number of stools matured in the field and the percentage of growing grains in the germination tests was about 12.

Flax.—Germination and field tests of flax injured in different ways are reported. The highest percentage of plants which matured in the field in these experiments was 29. The results of experiments in the improvement of flax by the selection of seed from individual plants is reported in Bulletin 50 of the station (page 55). With reference to shallow and deep planting of flax, the author makes the following statement: "All my observations cause me to believe that the seed bed for flax should be as firm as possible and that the depth of planting should if possible not exceed an inch of dirt cover."

Potatoes.—The general results obtained in 1901 bear out the conclusions given in a former bulletin (E. S. R., 9, p. 942). The general conclusion is drawn from experiments conducted for several years that the two ends of a tuber are practically of equal seed value. An experiment to determine the possibility of root fusion is reported, but the results were negative.

Miscellaneous experiments.—A series of germination tests of weed seeds planted at different depths was made. The greatest depth from which a seed produced a plant was 5 in. in the case of *Ambrosia trifida*. The prevalence of different plant diseases during the year is briefly discussed. A short note on the work in general for the year is given, and the new laboratories of the department are briefly described.

Experiments with field crops, R. S. Shaw (*Montana Sta. Bul. 32, pp. 16–20*).—This is a concise report on variety, culture, and rotation tests. Forty-three selected varieties of wheat gave an average yield of 52.6 bu. per acre. The best results for several years have been obtained from Kubanka, Red Fife, Russian 2955, Wild Goose, Wellman Fife, and McKissock Fife.

The average yield of 33 varieties of oats selected from a collection tested for some years was 87.9 bu. per acre. This season Poland White, American White, White Wonder, and Nameless Beauty were selected. White Russian, a variety selected the previous year, yielded at the rate of 110 bu. per acre, and the grain after cleaning and grading weighed 44 lbs. per measured bushel.

From about a dozen varieties of peas, Mummy and Canadian Golden Vine were the only varieties considered valuable.

The selections made from 52 varieties of potatoes under test were as follows: *Early varieties*—Six Weeks Market, Acme, Early Ohio, Early Oxford, and Early Vaughan; *medium varieties*—Rural New Yorker No. 2, Lee Favorite, Snow Drop, American Wonder, and Oregon Pearl; *late varieties*—White Maine.

A test of a 6-year rotation has been in progress for 4 years, and the yields from the different plats are recorded. The crops in rotation are wheat, clover, barley, sugar beets, oats, and peas. All yields, with the exception of the yield of sugar beets, show an increase in the productiveness of the different plats.

Brief notes on the work with barley, rye, and root crops are also given.

The Woburn field experiments, 1899 and 1900, J. A. VOELCKER (*Jour. Roy. Agr. Soc. England, 62 (1901), pp. 272-299, figs. 5*).—The plan of these experiments has been previously described, and the results of former years reported (E. S. R., 12, p. 132). In this report the results for 1899 and 1900 are tabulated and discussed.

In the continuous wheat-growing experiments, where the same fertilizers are applied every year, lime proved very beneficial in both years. In 1899 the nitrate of soda plats gave higher yields than the corresponding ammonia salts plats. The omission of nitrate of soda for a single year reduced the yield of grain 31 bu. per acre, and gave a crop only slightly exceeding the yield of the unmanured plats, while the corresponding omission of ammonia salts reduced the yield only 13 bu., and a crop of 10 bu. in excess of the unmanured wheat was obtained. The ammonia salts produced a better quality of grain than the nitrate of soda, the poorest grain being produced on the plat which had received nitrate of soda alone. Rape dust used in quantities furnishing the same amount of plant food as 100 lbs. of ammonia per acre proved more efficient than barnyard manure, and in each case previous applications of these slowly acting manures showed some effect on succeeding crops. In 1900, the twenty-fourth season of these experiments, the results with ammonia salts and nitrate of soda were relatively the same as in 1899.

The results of the continuous barley growing experiments in 1899 show that nitrate of soda gave better results than ammonia salts under the same conditions, the yields for both fertilizers being above the average. The use of lime with ammonia salts in these tests showed a very marked and favorable effect on the yield. Barnyard manure produced a better crop than rape dust, and here also, as in the case with wheat, the residual effects of these manures were quite marked. The quality of the barley as a whole, as well as the yield, was inferior, but the lower grade of barley was produced where nitrate of soda was used alone. The results of 1900 were similar to those obtained the year before. Pot experiments with barley, wheat, oats, and peas grown in soil from the plat on which ammonia salts alone had been used for 23 years showed that barley failed to grow, wheat grew fairly well, and oats excellently, while peas made only a stunted growth. The addition of carbonate of potash to the soil did not seem to have any effect.

The tabulated results of rotation experiments show that in one case wheat was more benefited by green manuring with tares than with cruciferous crops, such as mustard or rape, while in another mustard as a green manure was more effective than either tares or rape. The relative manurial value of decorticated cotton cake and maize meal was studied in this connection. In the rotation experiments the difference between manured and unmanured plats was inconsiderable, and the yields in general were lower than in previous years. Kiln-drying barley seed before sowing did not have any particular advantage. The best yielding varieties of barley were Danish, Golden Melon, and Goldthorpe, in the order given. Lucern on plats fertilized annually with 4 cwt. each of superphosphate, bone dust, and sulphate of potash, and 2 cwt. of nitrate of soda or sulphate of ammonia, gave much better yields than where other combinations or no manure were applied. A comparison of English and French sainfoin seed during the first year of the test did not show a very marked difference. An application of 2 tons of lime per acre in 1893 and 1900 on old pasture gave the best results as compared with other fertilizers. The lime plat presented a much better appearance and produced a decidedly finer herbage than any other plat. *Lathyrus sylvestris* grown since 1890 continued to yield good crops in 1899 and 1900. Spraying with Bordeaux mixture materially benefited the potato crop. In 1900 lime, gas-lime, and basic slag were tried as preventives of the finger-

and-toe disease in swedes. Lime was the most effective, although not entirely successful.

The Woburn pot-culture experiments in 1900, J. A. VOELCKER, (*Jour. Roy. Agr. Soc. England, 62 (1901), pp. 317–334, figs. 12*).—The purpose, plan, and previous results of these experiments have already been noted (E. S. R., 13, pp. 335).

The Hills experiments.—A test was made of treating the soil for wheat with lithium, potassium, and sodium chlorid at the rate of ½, 1, and 2 cwt. per acre. An additional test was made soaking the seed for 10 minutes in a 1 per cent solution of these different salts, and in 1, 10, and 20 per cent solutions of sodium iodid and sodium bromid. Lithium chlorid retarded germination, produced shorter and weaker straw, and gave a smaller yield of corn than any of the other salts used. The effect was the more marked as the quantity of lithium salt used was increased. The potash applications slightly increased the yield of corn and straw, and the use of sodium chlorid gave even better results than the potash salt. Soaking the seed before sowing in 1 per cent solutions of the different substances above mentioned was productive of some benefit. A 10 per cent solution of sodium iodid was too strong, but solutions of sodium bromid or chlorid of the same strength did not show deleterious effects. The benefit derived from the use of sodium bromid or chlorid for this purpose is considered uncertain. A 20 per cent solution of these three different salts was found harmful, the sodium iodid being the most injurious.

Experiments similar to those with wheat were made with barley. In these tests lithium chlorid had no retarding influence, and did not decrease the yield of straw, but it stunted the roots, seriously interfered with the development of root hairs, and largely reduced the weight of the grain. The use of potassium and sodium chlorids did not bring out any particular point. No benefit accrued from soaking the barley seed in solutions of 1, 10, or 20 per cent of either sodium iodid or sodium bromid. The stronger solutions of these salts had only a slight detrimental effect. Sodium chlorid had a bad effect, which increased with the strength of the solution.

Miscellaneous pot-culture experiments. Tests of thick and thin sowing of barley conducted in previous years were repeated in 1900. The barley was sown in pots at the rate of 5, 7½, 9, and 13 pks. per acre, and the heaviest yield was obtained from the thickest seeding. The best yield of grain and straw was produced from seeding at the rate of 7½ pks. per acre. It is considered advisable to sow barley thicker than wheat, the quantity recommended being 9 pks. per acre.

The experiments with hard and soft wheat on different kinds of soil begun in 1899, were continued in 1900, and the general observations of the first year were fully confirmed. "The soil . . . has the power of altering the character of the grain, and so it can not be said that soft seed necessarily produces soft wheat, or that the sowing of hard seed ensures a crop of hard wheat."

The Essex field experiments, 1896-1901. I, Permanent pastures, T. S. DYMOND (*Essex County Council, Tech. Instr. Com., Tech. Labs., 1901, pp. 42, fig. 1, dgms. 2*).—The results of these experiments on permanent pastures in various parts of Essex are briefly described and reported in tabular form. Experiments in seeding to grass showed that rye grass, cocksfoot, timothy, foxtail, and meadow fescue, together with leguminous crops, such as clover and lucern, make a good mixture for heavy clay soils with gravelly subsoil. Grazing allowed a quicker growth of grass than mowing for hay, but also encouraged weed growth and the disappearance of some of the sown grasses. The best means of increasing the nitrogen supply of the soil is to feed the stock liberally. Phosphatic fertilizers were found essential to the quality and quantity of the herbage on new and old grass land. Four cwt. of basic slag per acre applied every alternate year is recommended for old pasture. For new grass land mowing and grazing in alternate years, feeding the pastured stock with nitrogenous food to supply nitrogen to the soil, and dressing the land with 2 to 4 cwt. of basic slag per acre every alternate year is considered the best treatment.

In a test of improving old grass land an application of 4 cwt. of superphosphate of lime and 2 cwt. of nitrate of soda proved most efficacious. On abandoned grass land on heavy clay soil the only profitable fertilizer for a term of 3 years was basic slag. Potash, with which this soil is well supplied, was detrimental when used alone or with other manures. The use of barnyard manure was very unprofitable. It was found that the use of basic slag rendered the use of lime unnecessary.

Field experiments at Ploti Agricultural Experiment Station, A. G. KARABETOV (*Six. Rap. An. Sta. Expt. Agron. Ploty, 1900, pp. 1–73*).—In addition to experiments noted elsewhere (page 17) the following are reported: Experiments with winter wheat and rye in a 9-course rotation showed that early sowing gave larger yields, while thin sowing in some instances improved the quality. Land plowed in the fall or in April produced a larger crop of grain than land plowed in May. Deep plowing was most effective as compared with shallow plowing, and the results were most marked with winter rye. In corn culture experiments plowing 10.5 in. deep presented no advantages over plowing 7 in. deep. Plowing at these depths for sugar and fodder beets resulted in an advantage of shallow plowing for late planting and of deep plowing for early planting. In the case of potatoes deep plowing generally increased the yield. In one test grasses, sainfoin, and alfalfa were grown alone and with corn and sunflowers. The grasses when grown alone gave the largest yields of hay. The next largest yield was obtained when the grasses were grown with corn. Sainfoin gave good yields even in dry seasons. The results with sunflowers, saffron, and flax showed that deep plowing as well as early sowing are to be recommended for these crops.

Comparative experiments with barnyard manure and commercial fertilizers for winter wheat, beets, barley, lentils, and oats resulted in increased yields in all cases with the barnyard manure, the largest increase being obtained with winter wheat and beets. Barnyard manure applied with superphosphate considerably increased the yields of grain, roots, and lentils, and also improved the quality of the last-mentioned crop. Nitrate of soda had a depressing influence on lentils, barley, and oats. The application of phosphoric acid gave the best general results on this soil.

A number of other experiments, mainly variety tests, are described.

Arid farming or farming without irrigation, J. A. WIDTSOE and L. A. MERRILL (*Utah Sta. Bul. 75, pp. 67–116, figs. 9, chart 1*).—This bulletin discusses at some length the subject of farming in arid regions, with special reference to Utah conditions. The soil and climatic conditions of Utah, referring especially to the rainfall and relative humidity of the State, are considered, and different localities adapted to arid farming are pointed out. The various crops that can be grown in this connection are enumerated and the best methods of plowing, planting, fallowing, and harvesting in arid regions are described.

The moisture content of different kinds of soils at varying depths was determined and is reported in tables. The results of a number of tests reported show that fall plowing was more effective in the conservation of moisture than spring plowing.

In a pot experiment conducted to determine the quantity of water used by various plants to produce a pound of dry matter under Utah conditions, it was found that the quantity of water applied was equal to a rainfall of 22.4, 35.8, 16.3, and 29.2 in. for wheat, corn, peas, and sugar beets, respectively. Comparative yields of corn grown with and without irrigation from 1898 to 1901, inclusive, are also given.

Lucern, B. DYER (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 14 (1902), pp. 63–76*).—This article considers the use of fertilizers in alfalfa culture, and presents notes on some other leguminous crops with reference to the same subject. The results obtained in fertilizer experiments with alfalfa at Rothamsted (E. S. R., 7, p. 385) and Woburn (E. S. R., 13, p. 133) are reviewed. The author's work along this same line, now in progress for 5 consecutive years, has shown that moderate quantities of nitrate of soda as a fertilizer for alfalfa are profitable. Taking the average results for the 5 years, an annual dressing of 1 cwt. per acre increased the yield by nearly 3 tons of green fodder, and the use of 2 cwt. gave an increase of about 4¼ tons. An application of 4 cwt. per acre was less effective than an application of 2 cwt. Experiments with nitrogenous manures on garden peas and French beans also resulted in an increase of yield, being especially marked in the case of the French beans.

Lucern growing as fodder for stock, E. and O. EVANS (*Agr. Jour. Cape Good Hope, 19* (*1901*), *No. 13, pp. 812–821, fig. 1*).—A prize essay on alfalfa and its culture.

Overdressing of barley, H. BAIRD (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 14* (*1902*), *pp. 1–8, figs. 2*).—This article discusses the close dressing of barley in thrashing and the injury resulting from the practice. The author points out how injured barley corns are detrimental to the malting process.

Planting beets in hills, M. RINGELMANN (*Jour. Agr. Prat., 1901, I, No. 26, pp. 818, 819, fig. 1*).—A brief article discussing the relative advantages of planting beets in continuous drills, in broken drills, and in hills.

The breeding of cereals by means of artificial crossing, E. TSCHERMAK (*Ztschr. Landw. Versuchsw. Oesterr., 4* (*1901*), *No. 11, pp. 1029–1060*).—This article is a criticism and historical review of the artificial crossing of cereals. The percentage of a number of crossbred varieties of wheat, barley, rye, and oats is shown and the characters of the new varieties are described and discussed with special reference to the transmission of different characters as outlined by Mendel.

Stooling of cereals in its relation to their improvement, RIMPAU (*Jahrb. Deut. Landw. Gesell., 16* (*1901*), *pp. 210–219*).—An article considering the results obtained by different plant breeders with special reference to the stooling quality of the plants.

The influence of the color of clover seed on the progeny, C. FRUWIRTH (*Ztschr. Landw. Versuchsw. Oesterr., 4* (*1901*), *No. 7, pp. 749–755*).—The author sums up the results of different experiments in this line by other investigators and presents the report on his own observations. He found that pure yellow seed gave a higher yield of air-dry substance in leaves and stems than either spotted or dark violet seed. The color of the seed sown was in general predominant in the seed produced. The yellow seed was more prepotent than the violet. The different heads of the same plant did not always give like results.

Clover on soils poor in lime, P. P. DEHÉRAIN and E. DEMOUSSY (*Jour. Agr. Prat., n. ser., 3* (*1902*), *No. 2, pp. 40–42*).—The results of growing clover on lime-poor brush land showed that the bacteria necessary for the symbiosis with the clover plant were present in this soil and that a heavy application of lime gave only a slight increase in yield, while an application of garden soil was very beneficial, but less so in the presence of much lime. Clover was also grown in soil obtained from Brittany, but in this case an application of lime and phosphates was very efficient in increasing the growth of the plant.

Corn culture, J. H. SHEPPERD and A. M. TEN EYCK (*North Dakota Sta. Bul. 51, pp. 61–102, figs. 5*).—This bulletin gives the results of experiments in corn culture during 1900 and 1901 and republishes the results of earlier experiments (E. S. R., 11, p. 331). A study of root development of the corn plant is republished in abstract form from a former bulletin (E. S. R., 12, p. 516).

The yields of 23 varieties tested in 1900 and of 42 varieties tested in 1901 are tabulated. In 1900 Crossbred Dent, Mercer Flint, Squaw Flint, Triumph Flint, Selected Acme Dent, North Dakota White Flint, Crossbred Dimpled Dent, and Northwestern Dent were the best producing varieties, with an average yield of 39.1 bu. per acre. In 1901 Dawson Crossbred Dent, South Dakota Early White Dent, Smut Nose Dent, Compton Early Flint, Golden Dent, Triumph Flint, Mercer Flint, and Will Original Northwest Dent gave the largest yields of fodder and ears, the average yield of fodder being 3 tons and 1,056 lbs. and the average yield of ears 46.6 bu. per acre. In the production of ears alone the best yielding varieties in 1900 were Triumph, Longfellow, Dutton, Mercer, and King Philip. The proportion of corn to cob, as determined for 2 varieties in 1901, was 86.7 per cent shelled corn to 13.3 per cent cob for Golden Dent, and 78.8 per cent shelled corn to 21.2 per cent cob for North Dakota No. 100. A number of the varieties tested did not fully mature.

Experiments in thickness of planting showed the largest yields of fodder from corn planted in hills in rows 22 in. apart. Drilled corn produced more fodder than corn planted in hills in rows 44 in. apart, but the largest yield of ears was obtained from planting in hills. Corn sown broadcast did not yield as well as corn sown in drills. Drilling corn 6 in. apart in rows 3½ ft. apart gave the best average total yield for two years. In this experiment the yield decreased almost regularly with an increase of the distance between the plants in the row. Planting 6 kernels in a hill gave a larger yield of fodder and ears than planting a smaller number of kernels. As to depth of planting, 2 and 4 in. gave the best results.

In 1901 2 plats of corn were planted each week from May 18 to July 2. One plat was drilled in rows 6 in. apart and the other in rows 42 in. apart. It was found that late planting gave a greater yield of stalks and smaller yield of ears than early planting. The corn in the 6-in. drills yielded on the average 1 ton and 620 lbs. of dry fodder more per acre than the wider planting.

The results of shallow and deep cultivation were generally in favor of shallow cultivation. Shallow cultivation early in the season and deep cultivation late in the season gave better results than continuous deep cultivation or deep cultivation early followed by shallow cultivation later on. Harrowing corn immediately after planting proved a very effective means of destroying young weeds.

Rotation experiments have shown that corn stood next to potatoes as a rotation crop for wheat. Corn also proved an excellent rotation crop for flax.

Directions are given for preparing corn ground for wheat or flax and for breeding, selecting, and saving seed corn. The harvesting and saving of corn fodder is discussed, and experiments with the corn crop in its relation to soil moisture are reviewed.

Analyses of corn with reference to its improvement, J. T. WILLARD, R. W. CLOTHIER, and F. C. WEBER (*Kansas Sta. Bul. 107, pp. 57–98*).—Work of originating varieties of corn richer in protein has been in progress since 1898. In connection with this work analyses were made of varieties, single ears, and single kernels to determine their nitrogen content. The nitrogen in 33 varieties ranged from 1.56 to 2.26 per cent; in different ears of a variety grown for 30 years without admixture it ranged from 1.53 to 2.24 per cent, and in ears of a cross originated the previous year it varied from 1.35 to 2.22 per cent. The nitrogen content of single kernels from the same ear varied considerably but not to an extent as great as among different ears of the same variety. Efforts to determine a connection between the specific gravity of the kernel and its nitrogen content showed that while there seemed to be a tendency toward a higher nitrogen content with lower specific gravity, these factors were very irregular. It is concluded that corn rich in nitrogen can not be selected by means of specific gravity.

Of the original 33 varieties, 21 were selected for breeding purposes. "Each ear saved was pollenized by hand, and all other fertilization prevented. The crosses originated in 1898 in this way were planted in 1899, and each close fertilized. The ears obtained that year were analyzed, and the next season those showing 2 per cent or more of nitrogen were planted, as a rule. These were again close fertilized, the crop of each analyzed, and the same ones, in general, planted in 1901. These were again close fertilized and the ears produced analyzed. These crosses show remarkably high percentages of nitrogen in many cases, and all contain 2 per cent or more of nitrogen as the average for 3 years. In 12 cases the average is above 2.40 per cent of nitrogen, or 15 per cent of protein." The nitrogen content of each cross is recorded in a table.

A cooperative experiment in connection with this work is described, but for various reasons the outcome was unsatisfactory. The nitrogen content of commercial seed corn of 12 varieties was found to range from 1.39 to 1.81 per cent. This is considered deficient.

The cultivation of maize at the Cawnpore Experiment Station, P. V. Subbiah (*Dept. Land Records and Agr., Northwest. Provinces and Oudh, Bul. 16, agr. ser., 1901, pp. 29, pls. 5*).—This bulletin gives in a popular form brief descriptions of the methods of maize culture as practiced at the Cawnpore Experiment Station, and reports tabulated yields obtained during 19 years on plats permanently set apart for experiments with maize. A number of American varieties were compared with North Indian sorts. The author concludes that the American dent and flint varieties give larger yields and hence are well adapted for fodder, but that for the market the improvement of the lighter colored native maize must be the chief resource. The proportion of cobs to stalks and the measurement and weight of the cobs are briefly given in tables.

The cultivation of longer-stapled cottons at the Cawnpore Experiment Station, P. V. Subbiah (*Dept. Land Records and Agr., Northwest. Province and Oudh, Bul. 15, agr. ser., 1901, pp. 40, pls. 3*).—This bulletin presents tabulated results of experiments in acclimating foreign cottons and discusses the relative advantages of this work and the improvement of indigenous varieties. These experiments have been in progress since 1888. The results with American long staple varieties of cotton show that they can be successfully grown in North India. The seed of the American variety was uniformly larger than the seed of the native cottons. General directions for the cultivation of long staple varieties of cotton in North India are included in the bulletin.

Experience with cowpeas (*Rural New Yorker, 60 (1901), Nos. 2701, p. 739; 2702, p. 755; 2703, p. 770*).—This article describes cultural tests with cowpeas conducted in northern States. Satisfactory results are reported.

Modern flax culture in western France, H. Blin (*Jour. Agr. Prat., n. ser., 2 (1901), Nos. 35, pp. 270–273; 36, pp. 306–308*).—This article discusses the culture of flax for fiber as practiced in the west of France.

Drought-resistant forage crops at Highmore (*South Dakota Sta. Bul. 74, pp. 16, figs. 10*).—This bulletin is a report of progress in range and forage experiments at Highmore, S. Dak., begun in 1899 in cooperation with this Department. Former reports have been previously noted (E. S. R., 13, pp. 240, 639). This report is composed mainly of notes by L. W. Carter, who was in charge of the work. The method of treatment and the results obtained are briefly described for each plat.

Nevada blue grass (*Poa nevadensis*), feather bunch grass (*Stipa viridula*), western wheat grass (*Agropyron spicatum*), and brome grass (*Bromus inermis*) are considered useful in range improvement. No satisfactory yield of hay has so far been obtained from any of the perennials. Sorghums, corns, and millets in the order mentioned are recommended for winter forage. Cultivated rape produced 14 tons of green fodder per acre. Manuring and pulverizing overstocked prairie lands largely increased the yield of hay.

Grass experiments, H. J. Wheeler and G. E. Adams (*Rhode Island Sta. Bul. 82, pp. 125–140*).—The work here reported is in continuation of experiments previously noted (E. S. R., 12, p. 935). The treatment of each series of plats for 3 successive years, including 1901, together with the results obtained, is given.

Three grass plats were treated exactly alike during the experiments excepting that 1 plat had received no nitrogen for 11 years, while the second had received a small dressing and the third a large dressing of nitrate of soda annually since 1892. The large applications of nitrate of soda yielded much the greater profit. In 1901 the value of the hay from the plat receiving the heavy dressing exceeded the cost of the fertilizers by $40.70 per acre, and for the 3 years of the experiments by $90.72. In all instances the use of a complete fertilizer gave the best results. The formula used in 1901 in top-dressing the grass consisted of 807.5 lbs. of acid phosphate containing about 16 per cent of total phosphoric acid, 200.5 lbs. of muriate of potash, and 400.6 lbs. of nitrate of soda per acre. This application furnished the large dressing of nitrate of soda. The authors believe the results of 1901 to indicate that an application of 400 to 500 lbs. of acid phosphate, 250 to 300 lbs. of muriate of potash, and 350 to 400 lbs. of nitrate of soda per acre would perhaps have been more economical.

The original grass mixtures sown on these plats in 1898 consisted of 7½ lbs. each of common red clover and redtop and 15 lbs. of timothy. In 1900 the plat without nitrogen contained 222 grass stalks per square foot; the plat with the small dressing, or one-third ration of nitrogen, 271, and the plat with the full dressing of nitrogen, 236. During the last season of the experiments the plat receiving the full dressing of nitrate of soda had the heaviest stand of timothy, the relative percentages of timothy and redtop being 67 and 33 per cent, respectively. The increase in nitrate of soda produced a heavier stand of timothy and with it a larger yield of hay. This plat yielded at the rate of 9,390 lbs., or 4.7 tons, of hay per acre. "The most plausible explanation which has suggested itself for this striking result is the influence upon the growth of the crop brought about by the soda of the nitrate of soda, by virtue of its tendency to render the soil alkaline."

The shrinkage in the hay from the full nitrogen plat, after storing until the following February, was 19.6 per cent as compared with 14.9 per cent for the hay from the no nitrogen plat and 15.7 per cent for the plat receiving one-third of the full application of nitrate.

It was determined by analyses that 1,000 lbs. of field-cured hay, free from clover, removed from 5.6 to 5.8 lbs. of nitrogen, 14.7 to 16.2 lbs. of potash, and 3.3 to 3.5 lbs. of phosphoric acid from the soil. The different analyses of hay made in connection with this work are given in tabular form.

Brome grass and timothy compared, E. F. LADD (*North Dakota Sta. Rpt. 1901, pp. 13–18*).—The analyses of brome grass and timothy, the samples being taken from a pasture, are compared, and analyses of brome grass hay, including an ash analysis, are reported. The yields of forage and dry matter per acre for the two grasses are given. These experiments were in continuation of work undertaken in 1900, and the results of this season bear out the conclusions drawn the year before and previously noted (E. S. R., 13, p. 443).

Fowl meadow grass, L. R. JONES and A. W. EDSON (*Vermont Sta. Rpt. 1901, pp. 237–247, fig. 1*).—This grass is described and discussed, and results of experiments to cultivate it conducted from 1894 to 1901 are reported. It was found that from 6 to 7 bu. of seed, weighing 19 lbs. per measured bushel, may be obtained per acre. The yields of hay on the station plats were larger than the yields on natural overflowed intervale meadows, which produced from 1¼ to 2½ tons per acre. The fowl meadow grass plats yielded more from year to year, while adjacent timothy plats, owing to the growth of sedges, showed a gradual decrease in yield.

"For sowing in wet soils a mixture is recommended which may include variable proportions of redtop, fowl meadow, timothy, and alsike clover. If the soil is favorable to it the fowl meadow will form an increasing proportion of the crop until the third or fourth year when it will have entirely replaced the other grasses and thereafter persists." Sowing in midsummer without a nurse crop is recommended.

Comparative analyses made at the station of the hay of fowl meadow grass and timothy are tabulated. Fowl meadow grass hay is considered of excellent composition and reported as being relished as well by stock as the best upland hay.

The hop and its English varieties, J. PERCIVAL (*Jour. Roy. Agr. Soc. England,* *62 (1901), pp. 67–95, figs. 22).*—This article, taken from the author's agricultural botany (E. S. R., 12, p. 719), treats of the structure of the hop and describes the most important early and late varieties cultivated in England.

Manuring mangels (*Farmers' Gaz., 60 (1901), No. 45, p. 811*).—A brief note treating of the kind of soil best adapted to mangel culture and the methods of fertilizing it.

Test of various kinds of oats and their composition, J. Speir and A. P. Aitken (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 14 (1902), pp. 263–283*).—In this experiment new cross-bred varieties were compared with the older varieties in general cultivation and 2 Canadian sorts. The varieties tested were Tartar King, Tartar King Improved, Hamilton, Potato, Longhoughton, Goldfinder, Waverley, American Beauty, and Banner. The earliest variety was Tartar King Improved, ripening a few days before Tartar King. The number of days required to ripen the different varieties in 1900 and 1901 is given in a table. The proportion of grain to straw for all varieties in 1901 was 37 per cent and 63 per cent, respectively. A change of seed with 3 varieties resulted in an increase of 13⅝ bu. per acre. The yields for the different varieties, together with other data, are shown in tables. The analyses of the straw, entire grain, husks, and kernels of the different varieties in 1900 and 1901 are reported. In 1901 a long, dry, sunny summer was favorable to a good yield and the production of a heavy grain. The results are briefly discussed and the different varieties given in the order of their fodder value.

The culture of oats, L. Grandeau (*Jour. Agr. Prat., n. ser., 3 (1902), No. 2, pp. 38–40*).—The soil, application of manures, seeding, and cultural methods in connection with growing oats are considered.

Spring seeding of oats and barley, L. Grandeau (*Jour. Agr. Prat., n. ser., 2 (1901), No. 52, pp. 813, 814; 3 (1902), No. 1, pp. 10, 11*).—A general discussion on seeding oats and barley and the subsequent development of the plants as affected by different conditions of soil and climate.

Boxing seed potatoes, J. Speir (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 14 (1902), pp. 147–166, figs. 7*).—The system of germinating seed potatoes in boxes is considered at some length, and trials of its adaptability to different districts and to late varieties are reported. The results of these trials indicated that even late varieties may profitably be germinated in boxes before planting. The total average gain for all tests due to boxing the seed potatoes was 10¾ cwt. of potatoes per acre.

Fertilizer experiments with potatoes, S. Hammar (*Landtmannen, 12 (1901), No. 2, pp. 25–27*).

Rice growing in British Guiana (*West Indian Bul., 2 (1901), No. 4, pp. 275–284*).—A series of discussions concerning rice cultivation in British Guiana.

Sugar beets in Montana in 1901, F. W. Traphagen (*Montana Sta. Bul. 33, pp. 15*).—This bulletin reports the results of variety tests of sugar beets at the station and of cooperative culture tests carried on by farmers throughout the State. The general conditions of sugar-beet culture in Montana are reviewed. Of the samples analyzed, a sample of a Utah variety was the richest, containing 19.05 per cent of sugar in the beet, with a purity of 85 per cent. Kleinwanzlebener, Dippe, and 3944, headed the list of varieties, with an average sugar content in the beet of 17.61 per cent and a purity of 87 per cent. The lowest sugar content in the beet for the series of tests was 13.3 per cent. The general average for 37 samples of 7 different varieties was 16.98 per cent of sugar in the beet and a purity coefficient of 84.9.

Beets harvested October 12, 19, and 26 were richer than those harvested September 28 and October 5.

The results of the cooperative tests are given by counties, but no general averages are reported. In a general variety test with Kleinwanzlebener, Vilmorin, and Utah the best results were obtained with Kleinwanzlebener.

Sugar-beet experiments in Nebraska, T. L. Lyon and A. T. Wiancko (*Nebraska Sta. Bul. 73, pp. 27*).—Variety, fertilizer, and cultural tests with sugar beets are reported. Among 37 varieties, Original Kleinwanzlebener produced the largest amount of sugar per acre. The yield of beets for the different varieties varied from 5.62 to 15.72 tons per acre on heavy soil and from 9.54 to 15.54 tons on light soil. The richest beets were obtained from the heavy soil. The use of commercial fertilizers did not increase the yield sufficiently to warrant their application. Of the different fertilizers used, phosphate was most effective. Cultivating about 4 to 5 in. deep gave the best results as compared with cultivating 2½ and 6 in. deep. The moisture content of the deep and shallow cultivated plats is shown in a table. "Very deep cultivation will, late in the season, interfere considerably with the fine lateral roots of the beets, but in this climate of hot, dry summers with high winds the soil mulch, in order to be effective, must be 3 or 4 in. thick."

Planting in rows 18 in. apart, with 8 in. between plants in the row, gave better results than planting at other distances. The results of early and late planting of beets were not altogether conclusive, but the author believes that although good yields may be obtained from late planting the chances of success are in favor of early planting. Late cultivation injured the beets and slightly lowered the sugar content and purity, but an increase in yield made up for this loss. It was found that late cultivation had been very effective in conserving the soil moisture. Comparison of beets grown on weedy and clean ground showed that weeds may very materially reduce the quality of the beets. Analyses were made of a large number of samples to determine the effect of wet weather during the latter part of the growing period on the quality of the beets, and it was found that the percentage of sugar is rapidly reduced, but that "unless the fresh growth is accompanied by buds upon the crown there seems to be no real loss of sugar—the beets seem to increase in size and weight while the sugar remains at a standstill." Surface applications of lime are reported as effective in checking the Rhizoctonia rot and repeated spraying with Bordeaux mixture as preventing leaf spot. The season's experience showed that sugar beets are a drought-resisting crop. The cost of producing an acre of sugar beets is estimated at $40.74.

Sugar-beet investigations in 1901, J. W. AMES (*Ohio Sta. Bul. 132, pp. 53–72*).—This bulletin briefly summarizes the results for 1901 and presents them in detail in a series of tables. The results of variety tests in two different parts of the State were in favor of Original Kleinwanzlebener, showing in the one case a sugar content of 13.6 per cent with a purity of 82, and in the other a content of 16 per cent of sugar and a purity of 88. Of 216 samples of beets grown in cooperative tests, 194 came from the northern section of the State and 22 from the middle section. The average results show a sugar content of 12.8 per cent and a purity of 81.2 per cent for all these samples, and a sugar content of 14.5 per cent with a purity of 85 per cent for the samples from the northern section of the State, as compared with a sugar content of 11.2 per cent and a purity of 77.5 for the samples from the middle section.

Tests were made with different combinations of acid phosphate, sulphate of potash, chlorid of potash, nitrate of soda, tankage, and barnyard manure as fertilizers for sugar beets on yellow and black sand. On yellow sand the results on the fertilized and unfertilized plats were practically the same. On black sand the use of acid phosphate applied alone increased the yield of beets by 260 lbs. per acre, while the combination of phosphoric acid and potash and the application of a complete fertilizer increased the yield by 3,980 lbs. and 8,070 lbs. per acre, respectively.

Variety tests of sugar beets, J. J. VAŇHA (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 7, pp. 779–802*).—A test of 6 varieties of sugar beets is reported. The method of growing the beets is described and the mechanical and chemical analyses of the soil are given. The results are tabulated in detail and the merits of the different varieties are discussed. This being the first year of the test, no definite conclusions are drawn.

Large and small seed balls in sugar-beet culture, B. PROCHÁZKA (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 11, pp. 1061–1066*).—The results of comparative tests of large and small seed balls of the sugar beet, conducted by different investigators and by the author, are reported. The conclusion drawn from these results is that the seed balls should be of medium size, from 0.3 to 0.5 cm. in diameter, and weighing at least 2.5 gm. per hundred.

Breeding sugar beets, von Rümker (*Jahrb. Deut. Landw. Gesell., 16 (1901), pp. 219–231*).—A review of the work of breeding and improving sugar beets by different investigators. A detailed description is given of how this line of investigation is carried on.

The growth of the sugar beet, O. Vibrans (*Bl. Zuckerrübenbau, 8 (1901), Nos. 20, pp. 306–313; 21, pp. 323–331*).—The vegetative functions of the plant are discussed and the influences of different factors on its growth are pointed out. Observations in this line made by different investigators are reviewed.

Superphosphate and nitrate of soda as fertilizer for sugar beets, F. Lubanski (*Bl. Zuckerrübenbau, 8 (1901), No. 24, pp. 370–379*).—Tabulated results of cooperative experiments with superphosphate and nitrate of soda for sugar beets are presented and briefly discussed.

Experiments with seedling and other canes at Barbados in 1901, J. P. d'Albuquerque and J. R. Bovell (*Imp. Dept. Agr. West Indies, Pamphlet 13, 1901, pp. 47*).—A short account is given of the most important results of the year with experiments on selecting seedling and other canes in Barbados grown under the ordinary conditions existing on the estates where they were cultivated. The general field characters of the different varieties under test are briefly described and the results obtained with each variety on black and red soil are tabulated. Barbados Seedling 208, White Transparent, and Barbados Seedling 147, in the order mentioned, have given the best average results. Barbados Seedling 208 germinated readily, was generally free from disease, produced a juice of great richness and purity and a good yield of sugar. This variety also gave satisfactory results from plants and ratoons and on black and red soils.

Comparative culture experiments with various seed cane varieties, J. D. Kobus and J. A. van Haastert (*Meded. Proefstat. Oost Java, 3. ser., 1901, No. 32, pp. 20*).—A test with thirty unnamed varieties of sugar cane was carried on to determine their quality and manner of growth in different soils. The detailed results are given in tables. Great differences were found to exist, some varieties yielding only 50 per cent as much as others, some grew best on heavy clay, others on sand, while some grew equally well on all soils. It was also noted that certain varieties made the most rapid growth in the early stages, while others grew most rapidly during the latter part of the vegetative period.—h. m. pieters.

Composition of sugar cane, G. d'Utra (*Bol. Agr. São Paulo, 2. ser., 1901, No. 11, pp. 698–722*).—Analyses of different varieties of cane are tabulated.

Sugar-cane diseases in Gódávari and Ganjám districts, C. A. Barber, J. W. Leather, and C. K. Subba Rao (*Dept. Land Records and Agr., Madras, Vol. II, Bul. 43, 1901, pp. 181–210, pl. 1*).—This bulletin consists of a collection of papers describing the culture of sugar cane in the two districts. Analyses of soils from the Gódávari district are shown in a table.

The cultivation of the teasel, L. A. Clinton (*Rural New Yorker, 60 (1901), No. 2703, pp. 769, 770, figs. 3*).—A general discussion on teasel culture.

Effects of soluble and insoluble phosphate on the turnip crop, J. Milne (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 14 (1902), pp. 103–105*).—A brief report on cooperative tests of various forms of phosphate as fertilizers for turnips is presented. The greatest increase in the yield was obtained from the use of superphosphate applied with lime. The precipitation of the soluble phosphate in superphosphate by lime did not seem injurious to the turnip crop.

The adaptation and improvement of winter wheat, T. L. Lyon (*Nebraska Sta. Bul. 72, pp. 23*).—This bulletin reports the results of variety tests with winter wheat at the station and in different counties of the State. Of 118 varieties tested during the last 5 years Turkish Red and Big Frame have given the best results as to hardiness and productiveness. In 194 tests of these 2 varieties in 1900 and 1901 north of the Platte River or west of the 100th meridian, Turkish Red gave the better yields, while Big Frame was somewhat the hardier. In all the tests in that region there were only 19 cases of complete loss by winterkilling. Some of the Russian varieties under test have shown great hardiness and are considered promising for the northern part of the State, especially if they can be made to mature earlier.

Large, heavy seed gave much better yields than unselected seed. Wheat of the same variety from different sections of the country showed considerable variation in the habit of growth, much to the disadvantage of seed grown east of the Missouri River. It has been found that newly introduced wheats show a tendency to adapt themselves to their environment after a few years, and this fact is considered as hopeful that Nebraska-grown seed may become adapted to all arable sections of the State. The yields were nearly proportional to the tendency of early maturity of the variety. "Kansas-grown seed matured earliest and yielded best, but entirely winterkilled when Nebraska and Iowa grown seed of the same variety passed the winter successfully."

Ash analysis of wheat, E. F. LADD (*North Dakota Sta. Rpt. 1901, p. 18*). An ash analysis of a sample of Fife wheat grown in the Red River Valley is reported.

Hybridization of wheat, A. VILCOQ (*Jour. Agr. Prat., n. ser., 2* (*1901*), *Nos. 38, pp. 367–370, figs. 22; 39, pp. 396–400, figs. 7*).—An article giving some historical notes on the hybridization of wheat and the methods of performing the work.

Hybrid wheat de Massy, A. DUBOIS (*Jour. Agr. Prat., n. ser., 2* (*1901*), *No. 40, p. 433, fig. 1*).—A brief description of this variety.

Thick v. thin sowing of wheat and rye, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 2* (*1901*), *No. 36, pp. 298–300*).—The results of tests conducted on the experiment field at Parc des Princes are reported. The varieties of wheat and rye grown were Alsace and Brie, respectively. It is concluded that sowing for both these varieties at about the rate of 2 hectoliters per hectare gives best results.

Universal nomenclature of wheat, N. A. COBB (*Agr. Gaz. New South Wales, 12* (*1901*), *No. 12, pp. 1614–1629, pl. 1*).—This article considers nomenclature of varieties of wheat from an agricultural and commercial point of view. The author presents a colored plate and a description of Blount Lambrigg wheat as a sample of a series in which all varieties of wheat would be similarly described and illustrated, and which he considers as the chief need in connection with universal nomenclature.

Silos for grain, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 2* (*1901*), *Nos. 32, pp. 170–174, figs. 5; 33, pp. 210–214, figs. 5; 36, pp. 310–312, fig. 1*).—A number of underground silos formerly used for storing grain are described.

HORTICULTURE.

Experiments on the employment of chemical fertilizers in market gardening, E. HEGH (*Rev. Gén. Agron.* [*Louvain*], *10* (*1901*), *No. 10, pp. 464–475, figs. 8*).—A rather extensive series of cooperative experiments is here reported on the use of commercial fertilizers alone and as a supplement to barnyard manure for market garden crops. The experiments were carried out in duplicate at 10 different schools in Belgium, and for 2 years. The results secured are reported in considerable detail, and accompanied by illustrations showing the effects of the different manures on the growth of such crops as cabbage, leeks, celery, carrots, chickory, and peas. The tables contain data on a number of other vegetables also. Taken as a whole, the results are largely in favor of the use of commercial fertilizers in connection with barnyard manure for these crops. The use of chemical fertilizers alone resulted in yields equal to and sometimes in excess of the yields obtained with barnyard manure alone, but in no case was the use of either alone equal to the yields obtained from the two combined.

Fertilizers for garden crops (*Amer. Gard., 22 (1901), No. 365, pp. 858, 859*).—The advantages of the proper use of commercial fertilizers with certain kinds of vegetables are given. The work is based on the report of Truffaut and Denaiffe (E. S. R., 12, p. 851) and that reported by the New Jersey Experiment Station in using large amounts of commercial fertilizers on soils already very rich in plant foods (E. S. R., 11, p. 444).

The evolution of vegetable culture, W. W. Rawson (*Gardening, 10 (1901), No. 233, pp. 265–267*).—A paper on this subject read by the author before the Massachusetts Horticultural Society. The vegetables mentioned include asparagus, beans, beets, cabbage, celery, corn, cucumbers, lettuce, onions, peas, radish, rhubarb, squash, and tomatoes.

Soils and fertilizers for greenhouse crops, H. J. Patterson and T. H. White (*Maryland Sta. Bul. 81, pp. 77–96, pls. 5*).—Experiments are reported on the preparation of greenhouse soils with sand and clay loam, mixed with various stable manures, and with crimson clover; the use of stable manure and street sweepings in the greenhouse; transplanting lettuce; watering chrysanthemums with fertilizers in solution; and the use of commercial fertilizers in lettuce culture.

In the preparation of soils for lettuce no difference in the results was noticed, whether the stable manure used was mixed with the soil in a bed 6 in. deep or placed in a layer 2 in. deep at the bottom of the bed and covered over with 4 in. of soil, the amount of manure used being the same in both cases. Green crimson clover was successfully substituted for sod in the preparation of composts for use in the greenhouse. The use of well-rotted stable manure hastened the earliness of a crop of lettuce about 10 days, as compared with unrotted manure, but the total yield of lettuce was the same in both cases. Hog manure was most useful on light soils. A compost made with cow manure proved a more efficient soil for lettuce production than a like compost made with horse manure.

Street sweepings has been found very efficient and useful as a fertilizer for use in the greenhouse, both on account of its manurial value and its mechanical effects. A mulch of street sweepings 1 to 2 in. deep on lettuce prevented "damping off" and kept the under leaves of the plants in a nicer condition than when they lay on the soil. The use of two-thirds sweepings and one-third sand has given very satisfactory results as a soil for a number of potted plants. The sweepings made an excellent plunging medium for all classes of stock in the house and for rubber plants, and were valuable as a substitute for leaf mold and spent hops. It is believed that they may also be used in place of cocoa fiber, which is largely used by florists in Europe. The fertilizing value of fresh and of well-rotted street sweepings is given in the table below and compared with some other materials used in greenhouse soils.

Comparative analyses of street sweepings and other fertilizer materials.

Fertilizer materials.	Water.	Mineral matter.	Nitrogen.	Potash.	Phosphoric acid.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Street sweepings (fresh)	25.56	57.59	0.51	0.06	0.27
Street sweepings (well rotted)		36.40	.53	.42	.32
Horse manure (fresh)	48.69		.43	.44	.29
Cow manure (fresh)[a]	75.00	5.15	.57	.20	.31
Spent hops			1.08	.40	.31
Oak leaves			1.00	.35	.20
Jadoo fiber[b]			.76	.21	.56

[a] Samples from steers fed in concreted pits where all the liquid excrements were absorbed by the bedding.

[b] Peat moss soaked in a solution of fertilizing materials.

In a test of different methods of handling lettuce, transplanting to 2½-in. pots gave better results than growing 2 in. apart in benches covered 2 in. deep with soil. Experiments with solutions of cow manure, cow urine, and of various other fertilizers for chrysanthemums, indicated that phosphoric acid was especially valuable in the production of bloom. In 1900 the use of 600 lbs. of raw bone meal per acre for chrysanthemums in a solid bed gave slightly more satisfactory results than the same amounts of either dissolved South Carolina rock or slag phosphate. This, it is thought, is due to the nitrogen which the bone meal contained and which contributed to the production of a longer stem and richer foliage. The following season equally good results were obtained with all 3 fertilizers, and when these were used in connection with dried blood and muriate of potash, better blooms, with stiffer stems, shorter joints, and heavier dark-green foliage were obtained than when well-rotted stable manure was used.

Of a number of fertilizers used on lettuce grown in cold frames, a formula made up of 250 lbs. nitrate of soda and 750 lbs. dried fish resulted in the heaviest yield.

Vegetable raising in greenhouses in the Klin district, Government Tver (*Selsk. Khoz. i Lyesov., 202 (1901), Sept., pp. 549–593*).—The raising in greenhouses in the winter of cucumbers, beans, salad plants, and radishes, as an industry, has been conducted in the Klin district for 45 years and forms now the chief occupation of the peasants of many villages. The method of cultivation and the structure of the greenhouses are very imperfect, however.

Forcing lettuce, C. P. Close (*Utah Sta. Bul. 76, pp. 119–125, figs. 2*).—This bulletin contains the results of some experiments in the use of different soils for forcing lettuce, a test of the relative merits of Grand Rapids and Denver market varieties for forcing, and a test of the relative values for forcing of plants that appeared first above the soil from seed and those which appeared one day later. The experiment was repeated 4 times on a small scale, and the results are tabulated in some detail. They show, in general, that leaf mold is a safe substitute for rotted sod in Utah as a part of a mixture in forcing soils for lettuce. The soil which contained one part leaf mold produced a 15 per cent greater yield of lettuce than a similar soil containing one part of rotted sod. The total yield from Grand Rapids crops secured in these tests was nearly 40 per cent heavier than the total yield obtained from the Denver market variety. On the whole, the weight of the crop from seeds that germinated first was slightly greater than the weight of the crop from seed which germinated later. The advantage, however, is so slight as not to be worth considering.

Growing watermelons in the North; classification of watermelons, F. W. Rane (*New Hampshire Sta. Bul. 86, pp. 79–107, figs. 14*).—A successful method of growing watermelons in the North on a commercial scale, including directions for the selection of soil and location, planting, cultivation, picking, storing, and marketing watermelons, and the enemies affecting them, is given in this bulletin, together with the results of a variety test, including descriptive notes of 51 varieties, and the classification of these varieties, using the form and color of the fruit as a basis.

A rich, warm, sandy loam with a southern slope is advocated. Planting for southern New Hampshire should be between May 20 and 31. Hills 10 ft. apart each way should be made 18 to 24 in. across and 8 to 10 in. deep. In the station experiments these hills were first filled two-thirds full with a mixture of thoroughly rotted stable manure, to which a half pint of unleached wood ashes, fine hen manure, or a small handful of phosphate was added. Sufficient soil was then drawn over this and the whole thoroughly mixed together so that the hole was nearly full. More soil was then added, making the hill level with the ground. Ten or 12 seed were planted in a circle about 1 ft. in diameter in each hill, and these covered ½ to ⅔ in. deep with fresh, moist soil and pressed down. A little loose soil was then added to keep the moisture of the soil from evaporating.

The best sized melon for either home or retail trade in New Hampshire is one weighing from 12 to 25 lbs.

The varieties believed to be especially desirable for the North, named in order of merit, are as follows: Cole Early, Boss, Black-Eyed Susan, Peerless, Kleckley Sweet, Black Boulder, Black Spanish, Phinney Early, Frontenac, and Hungarian Honey.

On the basis of the color of the fruit watermelons have been divided into the following 6 classes: (1) Light green, (2) medium green, (3) dark green, (4) light striped, (5) dull striped, and (6) mottled. Each of these classes is again subdivided into groups according to the shape of the fruit. These subclasses the author has termed types, and each class of fruit is likely to have 3 types according as the shape of the fruit is (1) round or oval, (2) oblong or medium, and (3) long. The types are also classified as to the color of the seeds, whether light or dark. The various types are named after the variety of watermelon which is most prominent in that type. Fourteen of these type groups are described, and the varieties of watermelons belonging to each noted. The following table will indicate the classification adopted:

Classification of watermelons.

Shape of fruit.	Class.					
	I. Light green.	II. Medium green.	III. Dark green.	IV. Light striped.	V. Dull striped.	VI. Mottled.
Round or oval	Light Icing.	Peerless	Black Spanish	Cole Early	Pride of Georgia.	Nabob.
Oblong or medium				Delaware	Christmas	Phinney Early.
Long	Seminole	Kleckley Sweet.	Boss	Black Eyed Susan.	Cherokee Beauty.	

Muskmelons, J. Craig (*New York Cornell Sta. Bul. 200, pp. 159–176, figs. 12*).—This is a popular bulletin giving methods of commercial muskmelon culture observed in New York. The early crop is obtained by starting the plants in hotbeds or in the greenhouse. In the field the plants are set 6 ft. apart each way and manured in the hill by forking in either barnyard manure or a small amount of commercial fertilizers. Sometimes, however, the plants are grown in rows 5 to 7 ft. apart and the hills spaced 2 ft. apart in the row. Clover is the crop commonly used as the fertilizing agent in the crop rotation. The packages used in western New York are 12-lb. baskets, bushel baskets, and crates. The 12-lb. basket usually holds 16 melons, while the bushel basket and crate hold from 30 to 45 melons each. An average sized crate is 9 by 11 by 22 in. Brief notes are given on the insects and diseases affecting muskmelons, with suggestions for their control, and brief descriptive notes given on 63 varieties of muskmelons grown at the station in 1901.

American onions, A. R. Gross (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 115–132*).—Herewith is brought together a large amount of scattered information concerning the varieties of onions grown in America. A critical key is given to the garden varieties of *Allium cepa*, with a synopsis of a number of the more important varieties. Fifty-six varieties are described. Brief notes are also given on shallots (*A. ascalonicum*) and on Welsh onions (*A. fistulosum*).

The cooking quality of peas and beans as related to the commercial fertilizers applied to them, K. de Vrieze (*Deut. Landw. Presse, 28 (1901), No. 87, pp. 728, 729*).—Attention is called to the variation in the ease with which peas and beans grown under different conditions are thoroughly cooked and become soft and the probable cause of this variation is discussed. In conclusion the author states that peas which cook with difficulty are more common than beans of this character. This he explains as due to the fact that as a rule peas are planted earlier than beans and on account of the cold and moisture in the spring are not furnished with sufficient nitrates by the action of nitric ferments or of *Bacillus radicicola.* He recommends that some nitrate of soda be applied to both peas and beans at the time of planting to insure a product which will be easy to cook and will consequently bring a higher price.

Early tomatoes in the open ground (*Agr. Expts., 1 (1901), No. 9, pp. 215, 216*).—A paper on this subject read before the Minnesota State Horticultural Society. By sowing tomato seed in small window boxes the latter part of January and transplanting to a hotbed and the open ground May 10, the author was able to secure ripe tomatoes by June 27, and by July 11 in considerable quantities.

Experiments with tomatoes, B. D. Halsted (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 58–61*).—A brief account is given of a number of mutual crosses between Golden Sunrise, a yellow variety of tomato, and Dwarf Champion, an early red variety.

Ginger (*Indian Gard. and Plant., 9 (1901), No. 25, p. 434*).—Description of method of culture in South India.

Raising plants from cuttings, J. W. Coley (*Amer. Gard., 23 (1901), No. 370, pp. 56, 57*).—This paper treats in a practical way of the details of making and growing cuttings and plants.

The influence of stock upon scion, J. Burvenich (*Rev. Hort. Belge, 27 (1901), p. 257; abs. in Jour. Roy. Hort. Soc. [London], 26 (1901), No. 2–3, pp. 522, 523*).—A general review is given of this whole subject, many citations of practical examples being given.

Selection of scions, P. Durand-Dassier (*Rev. Vit., 16 (1901), No. 415, pp. 598, 599*).—Grape scions were selected from the base, middle, and tips of canes and compared for fruit production. Those taken from the middle of the canes have thus far given slightly the best yields.

Horticultural department, C. Wilson (*Montana Sta. Bul. 32, pp. 53–56*).—A brief report is given on the ornamental shrubs, shade trees, roses and other flowers that have been grown at the station, and also on the varieties of hardy apples, crabs, plums, strawberries, and raspberries. Of 50 deciduous shrubs tested for 4 years at the station, only 12 have been found to be hardy, 19 are semi-hardy, and 19 worthless. The 12 varieties of hardy shrubs are the American, European, and purple-leaved barberry; crimson dogwood; white-berried privet; yellow-flowering currant; white snowberry; snowball; and various species of lilac. Russian and Carolina poplars have proved especially valuable shade trees, both being particularly hardy. Boxelders grown from seed were also hardy, as well as mountain ash. The maple, English elder, ash, elm, and bur oak have proved worthless under station conditions. Of 28 kinds of roses tested, only 2—the Persian yellow and Magna Charta—have been found hardy enough to be grown without covering. Twenty varieties of apples have proved hardy and borne fruit. Notes are given on 4 of these—Longfield, Wealthy, Gideon, and Hibernal. Eleven crabs have proved hardy and are bearing fruit. Transcendant was one of the most satisfactory varieties. Of the many varieties of plums tested, only one—Moldorka—has succeeded in ripening fruit. Five varieties of strawberries are recommended, viz, Splendid, Bisel, Ivanhoe, Crescent, and Bederwood. Of the raspberries tested, only Marlborough, Hausel, and Brandywine have given satisfactory results under local conditions.

Report of the fruit experiment stations in Ontario, L. Woolverton et al. (*Ontario Fruit Expt. Stas. Rpt. 1901, pp. 64, figs. 18, map 1*).—This report is similar in character to those of preceding years (E. S. R., 13, p. 353). Notes, descriptions, and illustrations are given for the purpose of identification of 4 additional varieties of apples, 3 of grapes, 4 of peaches, and 6 of pears, grown in Ontario. A report of the inspection of the fruit experiment stations by H. L. Hutt is included, together with general notes by the experimenters on the growth and character of the fruit grown at the different stations. Ontario has 15 fruit experiment stations located in different parts between Georgian Bay, Lake Erie, and the St. Lawrence River.

Questions of hygiene in the fruit garden; on the basis of investigations of foreign stations for the protection of fruit trees, B. NALIMOV (*Selsk. Khoz. i Lyesov., 203 (1901), Oct., pp. 188–232; Nov., pp. 398–456*).—This treatise is a comprehensive digest of the hygienic requirements of plant life. The author discusses the rational care and nourishing of cultivated plants; the selection of hardy varieties; the diseases of plants and the injurious animals; remedies for combating these, and the services of phenology in the protection of the orchard. He dwells especially on the different species of aphis, the bark borers (Scolytidæ and allied species), the mold fungi (*Monilia fructigena*, *Penicillium glaucum*, *Botrytis cinerea*, etc.), the Acari, etc. In all cases the life of the insects or fungi are described and the remedies to combat them are given.

On the manuring of orchard fruit trees, L. GRANDEAU (*Rev. Hort.* [*Paris*], *73* (*1901*), *No. 22, pp. 525–527, figs. 2*).—The root systems of orchard fruit trees in poor and good soil are discussed and the method observed by the author in setting trees in the poor soil of Princes Park for a number of years is given. The method observed by the author is to dig a hole for the tree about 80 cm. deep. The first 35 or 40 cm. of the surface soil is thrown in a pile by itself and intimately mixed with 6 kg. of slag containing 18 to 20 per cent phosphoric acid and 5 kg. of kainit. This mixture is then put in the bottom of the hole and the tree set on top of it, the lower subsoil being used to fill up the hole. In the spring with the beginning of growth a liquid solution of nitrate of soda is added. The large amounts of slag and kainit used are justified by the author on account of the poverty of the soil of Princes Park. The first cost is stated to be about 0.6 franc and the amount believed sufficient to last 7 or 8 years. This method of setting out trees has been followed with success by the author for the past 10 years.

Orchard management, cover crops in orchards, pruning of orchards, report on fruits, S. T. MAYNARD and G. A. DREW (*Massachusetts Sta. Bul. 82, pp. 24, figs. 29*).—This is a popular bulletin, dealing in a general way with the best methods to pursue in Massachusetts in the culture of orchard fruits. Some data are included on the growth of a number of cover crops in the station orchard, but no conclusion is drawn. A number of illustrations are given showing the best methods of pruning trees. The yields obtained in a test of 31 varieties of strawberries, 17 of which were new varieties, grown at the station, are tabulated. The heaviest yields under field culture were made by Haverland, Clyde, Sample, and Gandy Belle. Notes are also given on grapes, blackberries, raspberries, and currants grown at the station.

Orchard notes, W. M. MUNSON (*Maine Sta. Bul. 82, pp. 81–96*).—This is largely a report on the value of certain hardy Russian and American sorts of apples that have been grown at the station and elsewhere in the State. Experiments in apple growing have been conducted by the station since 1890. A catalogue is given of 66 of the hardiest of the newer ironclad varieties grown, with notes indicative of form, color, size, quality, and origin of the fruit, and its adaptability to the northern and southern portions of the State, respectively. Most of the 50 or more varieties of Russian apples grown at the station, though perfectly hardy and very productive, are reported to be of poor quality, ripen early, and drop before maturity. Only three—Alexander, Longfield, and Yellow Transparent—are recommended for general culture in competition with apples of American and western European origin. The varieties recommended for the coldest section of the State, in addition to those already named, are Anisim, Arabka, Borsdorf, Cross, Green Crimean, Hibernal, Koursk Reinette, Pirk Anis, Prolific Sweeting, Repka Aport, and Russian Gravenstein. All of these varieties are described, as well as 12 other good, hardy varieties of American origin, and 4 seedlings. In growing fruit for market the author recommends that only a few standard sorts be planted.

The keeping qualities of 36 varieties, when placed in a cold cellar and examined from month to month, are tabulated. Based on the data thus obtained, the author states that "Dudley, Haas, and most of the Russian varieties are comparatively poor keepers and should be used before January. Borsdorf, Longfield, Pewaukee, Porter, and Shiawassee are at their best before the first of February, though keeping well into March. Hurlbut, Milding, and Munson Sweet begin to break down in March; the latter is in good condition from October to this date. Arctic, Bethel, Boiken, Mann, Northwestern Greening, Rall Janet, Stark, Westfield, and Winesap are in prime condition up to April 1. Munson Sweet, Porter, and Shiawassee showed most surprising results and indicate that with care these sorts may be kept much longer than is generally supposed. Peter, which became too soft for market in January, made very good pies as late as the end of March."

Cross fertilizing of apples, W. SAUNDERS (*Ontario Fruit Growers' Assoc. Rpt. 1901, pp. 34–37*).—This notes the efforts being put forth at some of the more northern and western experiment stations in Canada to secure hardy varieties of apples. More than 200 of the hardiest varieties of apples and crabs have been planted at Brandon and Indian Head, but none of them have produced fruit except seedlings of *Pyrus baccata*. The blossoms of this apple have been cross fertilized with pollen from some of the hardiest of the improved varieties, such as Tetovsky, Wealthy, and Duchess, and also with pollen of Transcendent, Hyslop, and Orange crabs. The seedlings of the fruit thus obtained have been planted. Thirty-six trees obtained from these crosses have fruited. Most of them have proven a great advance on the original crab. The fruit of 1 or 2 was about the size of the Transcendent crab and much better in quality. The crossing has been continued, using 20 to 25 different varieties of the hardiest apples, and a number of these have fruited. Altogether, some 16 or 17 varieties have been named, and 9 have been of such size and quality as would warrant their distribution in small lots to different parts of the Northwest country. The apples were small, but promise to be of great usefulness to people in those cold regions. Some of them make very good apple sauce and all of them exceedingly good jelly.

Why apple trees fail, E. WALKER (*Arkansas Sta. Bul. 71, pp. 32, figs. 16*).—Considerable loss occurs in Arkansas orchards each year from the dying of trees. The author made a trip of inspection among the apple orchards of Benton and Washington counties to investigate, as far as possible, the cause. In a general way, it is stated that some of the causes tending to bring about the death of the trees are poor soils, too close planting, lack of culture, indifferent care of the trees, use of diseased and poor nursery stock, the effects of sun scald, diseases, injurious insects, improper methods of pruning, over bearing, root rot, etc. These different matters are discussed in some detail and correctives pointed out.

An inventory of apples grown in Grand Isle County, F. A. WAUGH (*Vermont Sta. Rpt. 1901, pp. 277–313, map 1*).—A bulletin on apple growing in Grand Isle County by the station has been previously noted (E. S. R., 8, p. 791). In the present work a complete inventory of all apples growing in the county has been made and complete descriptions given of the 116 varieties. Some notes are also given on the probable source from which most of the varieties now grown in the county were obtained. The varieties of apples now most extensively grown in the county are Rhode Island Greening, Fameuse, Northern Spy, Ben Davis, Baldwin, Tolman, Roxbury, and American Golden Russet.

Propagation of plums—second report, F. A. WAUGH (*Vermont Sta. Rpt. 1901, pp. 257–269*).—This is the second report of the station on the growth and behavior of 5 varieties of plums, representatives of the Americana, Domestica, Japanese, Wildgoose, and Chicasaw groups of plums, respectively, on 4 different stocks, viz, Americana, Wayland type, Marianna, and Peach. The growth of the top, tap root, secondary and fibrous roots, height of trees, and the number and percentage of merchantable trees on the different stocks in the nursery are noted in tables of measurements and comparisons. In general, the results agree with those of 1899–1900 (E.

S. R., 13, p. 555). The figures given show that Milton and Newman are easiest to propagate, and Bavay, a variety substituted this year for Green Gage of the Domestica group, used last year, hardest to propagate. Chabot made the largest and cleanest trees. The highest percentage of merchantable trees and trees making the best average growth were produced on Marianna stock, though the largest number of trees was made on Wayland stock. Trees produced on Americana roots appeared to be stockier than on any of the other roots.

The growth of 4 varieties of Japanese plums, 23 of Americana, 4 of Nigra, 8 of Miner, 6 of Wildgoose, 9 of Chicasaw, 2 of sand plums, 2 of Myrobalan, 1 of Peach, and 11 of hybrid plums on Americana stocks during the past year from whip grafts has been made a special study, and the measurements secured are tabulated. The growth made on this stock seems, on the whole, to be satisfactory from the standpoint of the nurseryman.

As recorded in the report of the station for 1900, 3 of the best trees from each of the lots of plums propagated on the 4 different stocks—Americana, Wayland type, Marianna, and Peach, as noted above—were planted out in the permanent orchard. Data on the growth of these trees on each of the different stocks in 1901 are recorded. They agree in general with those obtained during the season of 1900 (E. S. R., 13, p. 555). Trees of Milton on Wayland roots made an upright, narrow, vase form, with relatively few branches; while on Marianna roots they were low, round-headed, and bushy, with spreading and drooping tops. The leaves of the trees on Marianna stocks were also several shades darker than on Wayland roots, and the twigs were dark red instead of green. This difference in the growth of the tree on these two different stocks is stated by the writer as being one of the most striking instances of the influence of stock on scion which he has ever observed. The growth of the trees on the different stocks the second year in the orchard indicated that Peach stock should be entirely discarded by planters having climatic and soil conditions like those of the station. At the present time, the experiments would seem to indicate that "Marianna is the best all-round stock from the standpoint of the orchardist—though not from the standpoint of the nurseryman—but that Americana is probably much better for Americanas."

Hybrid plums—third report, F. A. WAUGH (*Vermont Sta. Rpt. 1901, pp. 269–277*).—Earlier reports have dealt with the hybrid parentage of plums (E. S. R., 12, p. 239), including descriptions of a number of varieties. In the present work descriptive notes are given on 13 new hybrid varieties, some of which have not yet been put upon the market, and further notes added on 10 old varieties.

The class of hybrid plums which claims the Japanese plum (*Prunus triflora*) as a parent on the one side, and either the Wildgoose plum (*P. hortulana*) or Chicasaw plum (*P. angustifolia*) on the other, has been classified by the author under the name of the Gonzales group, after the variety of this name. The Gonzales variety is believed to come nearer being representative of this group in form of tree, habit of growth, character of fruit and foliage, than any other variety in the group. "This hybrid group now numbers so many promising horticultural varieties, it presents so many good qualities, it offers so many encouraging possibilities as a point of departure for further hybridization, and it is otherwise so important in general interest that it seems necessary to give it more careful consideration. The group is equally well marked as the Wildgoose group, and it already contains more promising varieties. From every horticultural point of view it is more important than the Wildgoose group. These reasons seem to justify us in describing it by itself and giving it a separate name." The group is described as a botanical variety of the Wildgoose plum and given the name of *P. hortulana robusta.*

The following varieties are included by the author within this group: Alabama, America, Biconical, Breck, Daisy, Dora, Eggles, Excelsior, Franklin, Georgia, Golden, Gonzales, Govalle, Halcyon, Juicy, Kelsaw, Lannix, Louisiana, Minnie, Monolith, Nona, Preserver, Ragland, Red May, Ruby, Satin, Scribner, Watson, Waugh, and Yates.

Peaches and nectarines (*Jour. Roy. Hort. Soc. [London], 26 (1901), No. 2-3, pp. 596-598, fig. 1*).—The very intimate relation existing between peaches and nectarines is pointed out. Nectarines are sometimes borne on peach trees and peaches on nectarine trees. An illustration is given of a fruit, three-fourths of which is a peach and the other quarter nectarine, not only in outside appearance but also in flesh.

Fruit culture in Egypt, G. Bonaparte (*Jour. Khediv. Agr. Soc. and School Agr., 3 (1901), No. 5, pp. 210-216*).—Notes are given on the varieties of citrus fruits and grapes grown in Egypt. Dried dates form the chief fruit of exportation. Methods of propagating and cultivating citrus fruits observed in Egypt are also noted.

Orange culture, picking, and packing, Johnston (*Jour. Jamaica Agr. Soc., 5 (1901), No. 12, pp. 479-486*).—Spanish and Jamaica methods of cultivating, picking, and packing oranges for market are contrasted. The author states that much more attention is given in Spain to field culture, picking the fruit, grading, wrapping, and packing, than in Jamaica.

Bananas under irrigation, H. J. Charles (*Jour. Jamaica Agr. Soc., 5 (1901), No. 12, pp. 467-476*).—The nature and general culture of bananas, including irrigation, are briefly considered.

Report on the cultivation of pineapples and other products of Florida, R. Thomson (*Jamaica Bd. Agr., 1901, pp. 15*).—The author visited Florida and describes the methods followed there in growing pineapples under sheds and in the open. The cultural methods observed with oranges, cassava, mangoes, etc., are also reported upon briefly.

Seasons for planting pineapples (*Jour. Jamaica Agr. Soc., 5 (1901), No. 10, pp. 405, 406*).—It is stated that while pineapples may be set out in Jamaica nearly any time during the year, the best results are secured when the plants are set in June and July or in November and December, and as soon after the "rains" as possible.

Pine cultivation in Jamaica, H. H. Cousins (*Jour. Jamaica Agr. Soc., 5 (1901), No. 10, pp. 403-405*).—Some of the difficulties in pineapple growing in Jamaica are pointed out. Drainage is stated to be the most neglected feature of pineapple cultivation in Jamaica. In confirmation of this statement the results secured on an 8-acre plantation of pineapples are noted. Four acres were planted on flat land, 2 acres with 1-ft. trenches, and the remainder with 2-ft. trenches. The pineapples planted on the flat land died out entirely, except on a few isolated hillocks. The 1-ft. trenches sufficed to save the plants on 2 acres, but the fruit was only moderate. Where the drainage was 2-ft. deep the pineapples were a success. Another mistake in the islands is the use of too rich soil. It is stated that soil containing 30 times the amount of plant food present in the Florida sands has been used in some instances, with the result that the plants made phenomenal growth of foliage, but scarcely any fruit. Nine-tenths of the plants were monstrosities. The fruits consisted of reduplicated crowns and in some cases a mass of axillary leaf shoots. The danger in using raw organic manures for fertilizing pineapples is pointed out. The following pests have been noted: Mealy bug, pineapple scale, blight, and the puccinia disease. In conclusion, the author states that pineapples can be grown to perfection in Jamaica on a large scale when proper attention is given to the natural requirements of the plant.

The date-palm tree, G. Bonaparte (*Jour. Khediv. Agr. Soc. and School Agr., 3 (1901), No. 6, pp. 262-267*).—Notes are given on the use of the date palm in Egypt and on 10 varieties growing there. Methods of propagation, irrigation, and drainage, cultivation and fertilization of dates observed there are also considered, and mention made of some of the secondary products of the date palm and their uses.

The "arctic" berry fraud, J. W. Blankinship (*Montana Sta. Bul. 32, pp. 41, 42*).—Attention is called to a fruit which has been more or less successfully peddled throughout the State, and which is claimed to be a new production obtained from crossing a large number of different berries and fruits. The fruit in question seems to be the white mulberry (*Morus alba*).

New classifications of fruits, G. Bellair (*Rev. Hort. [Paris], 73 (1901), No. 24, *pp. 566–570*).—A classification has been made of the different varieties of pears grown in the pomological regions of France, as to choicest fruits, cooking and show fruits, market or local fruits, and varieties of still lower qualities. Under each heading an indication is given of the quality, time of maturity, and character of the tree of the different varieties coming under it.

Report of the committee on new fruits, H. L. HUTT, W. T. MACOUN, and L. WOOLVERTON (*Ontario Fruit Growers' Assoc. Rpt. 1901, pp. 13–17*).—Brief descriptions are given of 6 new apple seedlings, 2 peaches, and 1 each of pears, plums, and raspberries, all of Canadian origin.

Old world contributions to western orchards, C. E. BESSEY (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 26–34*).

Spring frosts and fruit trees, H. MÜLLER-THURGAU (*Ztschr. Pflanzenkrank., 10* (*1900*), *pp. 335–340, figs. 3; abs. in Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 1, pp. 193, 194*).—A study is here reported of the effects of late spring frosts on flower buds of cherries, apricots, peaches, and strawberries.

Fruit shipments to Britain, J. W. ROBERTSON (*Ontario Fruit Growers' Assoc. Rpt. 1901, pp. 63–75*).—An account of the experiments being made in Canada in shipping orchard fruits to England. The report is largely devoted to methods of cold storage observed.

Coffee culture, A. HEMPEL (*Bol. Agr. São Paulo, 2. ser.* (*1901*), *No. 12, pp. 783–786*).—Notes on coffee culture are presented in a popular manner.

Cacao culture and preparation, H. J. WIGMAN (*Teysmannia, 12* (*1901*), *No. 2–3, pp. 102–111*).—The author describes the methods of harvesting cacao and preparing the beans for market. The beans must be well ripened, but not overripe, since both immature and overripe beans are of inferior quality. Fruits from different varieties must be kept separate, special treatment being required for each kind. Fermentation is necessary not only to enable the planter to remove the husk from the bean, but also to improve the quality and color. The white seeds of the Nicaragua cacao require only 4 to 8 hours of fermentation to take on the proper color. The varieties whose seeds have a white fracture give the best beans, as they take on the chocolate or light brown tint desired in the trade.

When the fruits are gathered they are piled up and allowed to remain for a few days before being taken to the husking sheds. Here the outer shell is removed, and on well-managed plantations is disposed of in such a way as to prevent the possibility of infecting future crops with fungus diseases. The husked beans are allowed to lie for a few hours, after which they are spread in the sun to dry for 5 or 6 hours. They are then raked into piles to sweat, and the next day are again spread out. This process is repeated until the beans are cured. The piles of fermenting beans attain a temperature of 100 to 120° F., and occasionally 190° F. is reached. The latter is, however, dangerous, for it has a very detrimental effect upon the quality of the beans. Frequently red clay, ocher, or annotto is used to give a good color to the cacao.—H. M. PIETERS.

The culture of rubber plants in Java, YERSIN (*Rev. Agr. Réunion, 7* (*1901*), *No. 4, pp. 152–160*).—An account is given of the culture and growth of *Ficus elastica* and *Hevea brasiliensis*.

Notes on rubber strip for grafting, R. B. ROGERS (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 1, p. 248*).—Pure rubber strip has been found very useful by the author in grafting. The material used is the same as that employed in insulating joints on electric wires, and can be bought in the form of a small roll of tape. The graft is cut to fit the stock in the usual way, and the rubber strip well stretched and then wound around the joint so as to cover the whole of it from end to end. It should be stretched tightly while laying it on, in order to form an air-tight covering and hold the graft firmly in place. A strip 4 to 5 in. long and ½ in. wide is sufficient for ordinary grafts. Rubber solution should be used for moistening the ends to make them stick. When old rubber strip was used it was found to perish quickly in the sun. This was avoided by covering the graft with raffia. The raffia should be removed as soon as the graft unites, in order not to form a harboring place for insects, etc. It is not necessary to remove the rubber strip, since it stretches and rots off with the growth of the graft.

The caoutchouc tapper, H. C. Praasterink (*Teysmannia, 12 (1901), No. 6, pp. 253–256, figs. 3*).—The writer calls attention to the wasteful methods of gathering caoutchouc at present in use. By these methods the sap is not only wasted or obtained in a very impure state, but the trees and vines are greatly injured or destroyed.

He has devised a special chisel, with concave upper surface and with a hole near the handle end. This is to be driven into the tree in such a way that the sap will flow down the chisel to the hole, to drop through this into a wooden bucket. In a note the editors question the practicability of the use of this device in all cases.—H. M. PIETERS.

New method of propagating gutta-percha trees (*Indian Gard. and Plant., 9 (1901), No. 25, p. 432*).—This is a Sumatra method, and consists in laying down young saplings, the size of a lead pencil or a little larger, in a horizontal position. When these make shoots 3 or 4 in. long at right angles to the stem, the stem is cut entirely through about an inch on either side of the shoot. The cuttings are then inserted in clayey soil and kept in a damp, cool place until rooted.

Possibilities of strawberry culture in the State, J. W. Blankinship (*Montana Sta. Bul. 32, p. 42*).—It is stated that there is about a week's difference between the opening of the flowers and the ripening of the strawberry fruit for each successive elevation of 2,000 ft. in Montana. It is pointed out that advantage might be taken of this to secure berries over a long period of time.

Culture of strawberries in the district of St. Geniez, E. Marre (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), Nos. 45, pp. 548–550; 46, p. 577; 47, p. 612; 50, pp. 699–707, figs. 14; 51, pp. 734–738*).—The methods observed in growing and marketing strawberries are given.

Salicylic acid, a normal constituent of strawberries, L. Portes and A. Desmoulières (*Ann. Chim. Analyt., 6 (1901), pp. 401–407; Chem. Centbl., 1901, II, p. 1360; abs. in Jour. Soc. Chem. Ind., 21 (1902), No. 3, p. 182*).—Analyses of several samples of fresh strawberries shows salicylic acid to be a normal constituent of this fruit to the extent of about 1 mg. per kilogram.

Notes on ringing and other like practices with table grapes, F. Charmeux (*Jour. Soc. Nat. Hort. France, 4. ser., 2 (1901), Dec., pp. 1147–1156, figs. 11*).—The author practices ringing of vines to produce large, early fruits for the horticultural fairs. When strong cord was firmly wrapped around the internode of a shoot below a bunch of fruit the effect was practically the same as though the shoot had been ringed. Like results were also obtained when the node below the fruit was twisted when the plant was in full bloom. The fruit above the twist grew large and beautiful, but the shoot thus twisted was more subject to the attack of the oidium.

Fruit forcing under glass, W. Turner (*Amer. Gard., 23 (1901), Nos. 370, p. 56; 371, p. 72*).—The growing of Vinifera grapes under glass is considered. It is advised that the grape house be entirely separate from the plant house in order to avoid the mealy bug. The early grapery should be started with a night temperature of 45° F., with 10 to 15° higher in the day time. The temperature should be raised 5° every 2 weeks until a night temperature of 70° is attained. The vines require syringing 3 times daily until growth begins, then once in the morning and once in the afternoon. When the vines are in heavy foliage syringing once in the morning is considered sufficient. On cloudy days no syringing is required. With the coloring up of the fruit, water should be withheld. The border however should receive a heavy watering at this time which, in the author's experience, is sufficient to mature the grapes. The varieties Muscat of Alexandria, Black Hamburgh, and Madresfield Court are considered the 3 best table grapes.

Vine culture as exemplified at the Paris Exposition, J. BLYTH (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 2–3, pp. 428–449*).—This is largely a statistical article showing the production of wine in the different countries of the world and giving a discussion of the more prominent wine districts of Europe and elsewhere.

Experiments with commercial fertilizers on vines, E. ZACHAREWICZ (*Prog. Agr. et Vit.* (*Éd. L'Est*), *22* (*1901*), *No. 46, pp. 568–577*).—The results secured in a number of different vineyards where commercial fertilizers were used are recorded. Nitrate of soda was used advantageously in connection with sulphate of potash and superphosphate of lime. The use of these three materials together increased the yields, hastened maturity, and improved the quality of the wine.

Grafting of vines, A. VILLE (*Bol. Roy. Soc. Tosc. Ort., 26* (*1901*), *No. 7, p. 195; abs. in Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 2–3, pp. 551, 552*).—A description is given of the English herbaceous or Lafleur graft.

The propagation and cultivation of the vine in South Africa, J. P. DE WAAL (*Agr. Jour. Cape Good Hope, 19* (*1901*), *No. 12, pp. 770–780; 20* (*1902*), *No. 1, pp. 42–53*).—An article on the establishment and care of vineyards and the varieties best suited to the colony.

A native hedge plant, J. W. BLANKINSHIP (*Montana Sta. Bul. 32, pp. 38–40*).—This refers more particularly to the buffalo berry shrub (*Shepherdia argentea*), which has been fairly successful in some portions of the State as a hedge plant. It is stated that the berry will not grow in the foothills above 3,000 ft. altitude, but it is thought possible that the black and red haw (*Cratægus coccinea* and *C. douglasii*) may take its place in higher situations. The barberry and privet, it is stated, are perfectly hardy in most situations below 5,000 ft.

Some talk about wild gardens, H. S. LEONARD (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 1, pp. 47–67, figs. 3*).—A suggestive article on planting wild gardens, with a number of lists of hardy trees, shrubs, flowers, aquatics, etc., desirable for culture in wild gardens.

Production of double flowers, DOUGLAS (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 1, pp. XXXV, XXXVI*).—The author states that in growing carnations for more than 30 years, when seed from the best double flowers were saved they produced on the average 5 per cent of double flowers as good as the parents, 12 per cent single flowers of every shade of color, and 83 per cent of flowers which were double, but in no respect equal to the parents in form, etc. It is noted that the largest amount of seed producing double flowered stocks is obtained from stocks grown in pots.

Carnation and dahlia scales, L. BARRON (*Amer. Gard., 22* (*1901*), *No. 365, p. 858*).—The scales of points used by the Carnation and Dahlia Society, of Victoria, in marketing these plants are given. In carnation, the points are: Color, 25; size, 20; form, 15; stem, 10; substance, 10; calyx, 10; fragrance, 10. The dahlia is divided into 3 classes—cactus, single, and fancy. With the cactus and fancy dahlia the points are: Form, 2; good center, 2; color and freshness, 2; size, 1—total, 7. With the single dahlias the points are: Effective arrangement, 1; color and freshness, 1; form, 2; size, 1—total, 5.

Ringing chrysanthemums, U. P. HEDRICK (*Amer. Florist, 17* (*1901*), *No. 707, pp. 729, 730*).—In the author's experiments it was found that ringing promotes earliness and largeness of blooms in the chrysanthemum. One hundred plants were experimented with, a part of them being ringed at about the time or a little before the buds began to show color. A band of bark about one-half inch wide was entirely removed from the stem by the aid of a sharp knife just below the point where the stem was severed for cut flowers. It is stated that the plants suffered no perceptible injury from the ringing in any respect, not even wilting in the slightest degree. In addition to increasing the size and hastening the development of the blooms, it was noticed that the leaves above the rings were larger and greener. From the results obtained it is believed by the author "that there is a valuable field for experiment by the florist in the ringing of the chrysanthemum and such other plants as are discarded after flowering."

The origin and development of the cactus dahlia, C. G. Wyatt (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 2–3, pp. 467–477, figs. 6*).—The cactus dahlia (*Dahlia juarezii*) is stated to have been introduced into Holland from Mexico in 1872. The author does not believe that the *D. juarezii* is wholly responsible for the cactus dahlia of the present day.

A new race of hybrid alpine irises, W. J. Caparne (*Gard. Chron., 3. ser., 30* (*1901*), *No. 779, p. 397*).—This race has resulted from hybridizing the dwarf bearded iris with many alpine and subalpine species. They blossom early and are suitable for exposed windy positions as well as elsewhere, and for forcing. The leaves are 3 or 4 in. long at flowering time and afterwards are prolonged 6 or 8 in. and ½ to 1 in. wide. The flowers are borne on stiff succulent stalks 4 to 8 in. tall and are quite large, resembling in shape the German iris. The colors range from pure white to crimson, yellow, and blue.

On the cultivation of Oncocyclus irises, H. Ewbank (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 2–3, pp. 314–323, figs. 5*).—The author has found that lime is an absolute necessity in the successful culture of these irises. Other cultural requirements are a sunshiny situation, overhead shelter in summer months, perfect drainage, firm planting, the rhizomes slightly covered—sufficient to protect them from frost, and the borders should be kept free from weeds or anything that obstructs the light.

On some experiments in the cultivation of Oncocyclus irises, J. Hoog (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 2–3, pp. 324–326, fig. 1*).—An analysis is given of the soils in which Oncocyclus irises grow wild and of Dutch bulb garden soil. The soil in which the irises grew naturally contained 155.8 gm. of lime, 49.56 gm. of magnesia, 30.78 gm. of oxid of iron, and 7.58 gm. of alum, in each kilogram of soil; while the Dutch bulb soil contained but 1.84 gm. of lime, 0.52 gm. of magnesia, 5.24 gm. of oxid of iron, and only a trace of alum in a kilogram of soil. The much larger quantity of lime, magnesia, etc., in the soils in which the irises grow wild suggested a reason for the partial failure of these plants in Dutch bulb soil. Experiments were therefore undertaken in which increasing amounts of lime and magnesia were added to the bulb garden soils. It was found that when 20 kg. of marl and 9 of magnesite were added to a bed of soil 8 yds. long by 1 in width, the irises grew luxuriantly, and the secret of their culture is, therefore, thought to be solved for the soils in question.

Forcing lilac flowers, F. van Driessche (*Rev. Hort. Belge, 27* (*1901*), *p. 228; abs. in Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 2–3, p. 559*).—Lilac blossoms were obtained in August by removing all the leaves of the shoots soon after the flower buds formed in July.

Official report of the Conference on Lilies (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 2–3, pp. 332–427, figs. 52*).—Herewith is contained an account of the Conference on Lilies, held at Chiswick July 16, 1901, and of the papers presented on that occasion. The titles and authors of these are as follows: Descriptions of the New Species and Principal Varieties of Lily Discovered since the Publication of the Monograph of Elwes (1880), J. G. Baker; Notes on Chinese Lilies, A. Henry; The Lilies of the Western United States and British Columbia, C. Purdy; Dutch Lilies, E. H. Krelage; *Lilium sulphureum*, F. W. Seers; Notes on *Lilium medeoloides*, A. Unger; Lily Diseases, G. Massee; Notes on my Experience with Lilies, G. F. Wilson; Lilies from Seed, F. W. Burbidge; Lilies in a Town Garden in the North, G. Yeld; Lilies in the Open-air Garden and Woodland, W. Goldring; Lilies, J. C. Ley; Lilies at Yalding, in Kent, S. Reid; Lilies in Devonshire, G. S. Patey; Experiences in

Growing Lilies, Dr. Bonavia; An Amateur's Attempt to Grow Lilies on Chalky Clay, H. Jonas; Lily Culture Under Glass, R. W. Wallace; Notes on a Supposed Hybrid Between *L. pardalinum* and *L. parryii*, J. S. Whall.

Rose Balduin, or Helen Gould (*Amer. Gard., 23 (1901), No. 370, p. 54*).—This rose, which has been variously called Balduin, Helen Gould, Red Kaiserin, etc., has been found by a committee to be one and the same rose, the proper name of which should be Balduin.

Perfume plants (*Queensland Agr. Jour., 9 (1901), No. 5, pp. 492–494*).—Extract from a paper by J. Chapelle, read at the Sixth International Agricultural Congress, held at Paris in July, 1900. Methods of hot and cold extraction of the perfume and essential oils of plants are noted, as well as the present condition of the cultivation of scent plants and of the manufacture of essential oils.

FORESTRY.

Forest work in the States (*Forestry and Irrig., 8 (1902), No. 4, pp. 149, 150*).—A brief review is given of the forestry work being conducted in the different States of the Union. Thus far the subject of forestry has received legislative recognition in 18 States, and at present forestry is being actively pursued in 15 States, as follows: Connecticut, Kansas, Maine, Maryland, Michigan, Minnesota, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Oregon, Pennsylvania, West Virginia, and Wisconsin.

Forests, Arbor Days, and manuring forest trees, F. E. H. W. Krichauff (*Jour. Roy. Hort. Soc.* [*London*], *26 (1902), No. 4, pp. 790–794*).—A discussion is given of the forest area and production of the principal countries of Europe and America, and the practice of Arbor Day planting is commended. Compiled notes are also given upon the value of the use of various fertilizers in forest plantings. The use of fertilizers is particularly commended in nurseries. Where fertilizers are applied to single trees, it is said they should not be used in large quantities or without being well mixed with the soil.

Teaching forestry at Berea College, S. C. Mason (*Forestry and Irrig., 8 (1902), No. 4, pp. 168–171, figs. 4*).—A brief outline is given of the course of instruction offered at Berea College, in central Kentucky, and the management of the college forest reserve is described.

The disabilities attaching to the planting of woods, G. Cadell (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 14 (1902), pp. 8–15*).—Attention is called to a number of the factors which tend to make the planting of forests in Great Britain unprofitable. Among the factors mentioned are the increased cost of planting, taxation, the low quality of home-grown timber, scarcity of trained woodsmen, cost of transportation, etc.

Forest trees for calcareous soils, P. Mouillefert (*Jour. Agr. Prat., n. ser., 3 (1902), No. 19, pp. 601, 602*).—Attention is called to the value of a number of trees and shrubs for planting in calcareous soils. The rate of growth of a number of these species is given, as well as descriptions of the trees and suggestions for their utilization. Among those mentioned are larches, spruces, yew, Virginia juniper, beech, dogwood, cherries, hazel nuts, hornbeam, etc.

Exotic conifers, their timber and value as an investment, D. F. Mackenzie (*Trans. Higland and Agr. Soc. Scotland, 5. ser., 14 (1902), pp. 48–63*).—After reviewing the forest conditions of Great Britain and commenting upon the rate of growth and yield of a number of exotic conifers, the author describes in considerable detail about 2 dozen species of trees, comparing them with the Scotch fir taken as a standard. The values given are the results of the measurements made of a large number of trees, and, as far as possible, show the true average rate of growth and comparative value. In general, the timber of the exotic trees is considered equal if not superior to that produced by native species, and although not always as strong this defect can be remedied by proper sylvicultural treatment. As a rule the timber of the exotic species is more easily worked, and this is considered a decided advantage.

English coppices and copsewoods, J. NISBET (*Jour. Bd. Agr.* [*London*], *8* (*1902*), *No. 4, pp. 479–488*).—In continuation of a previous article (E. S. R., 13, p. 959) the author describes the treatment of English coppices and copsewoods through the eighteenth and nineteenth centuries. On account of improved conditions of communication, abolition of duty on timber, the use of chemical extracts for tanning, the use of substitutes in place of wood, together with other causes, a decline in the profits from copsewoods has been occasioned, until at present there is hardly any revenue to be obtained from such forests in parts of England. Where land is said to be decidedly poor in quality it is questionable whether it would be more profitable to work it as a simple coppice or to clear it gradually and replant with pines and firs.

The forests of Prussia, G. H. MURPHY (*Tradesman, 47* (*1902*), *No. 7, p. 78*).—According to the author, 20,435,499.8 acres, or 23.7 per cent of the area of Prussia, is occupied by forests and orchards. The ownership of the forests is as follows: State property, 6,319,072 acres; Crown property, 178,950.8 acres; forests partly owned by the State, 2,805.3 acres; communal property, 2,727,109.7 acres; forests owned by institutions, 242,089 acres; forests owned by companies, 584,216.3 acres, and private property, 10,381,156.5 acres.

The forests are divided into deciduous and evergreen, the deciduous forests amounting to 30.9 per cent of the total forest area, while the evergreen forests amount to 69.1 per cent. The forests yielded in 1900 in wood, tan bark, oziers, etc., a total of 868,977,586 cu. ft., or about 105.9 cu. ft. per hectare of the entire forest area.

The State forest nursery at Gosford (*Agr. Gaz. New South Wales, 13* (*1902*), *No. 1, pp. 54–58, pls. 5*).—This nursery, which consists of 65 acres, is maintained by the New South Wales Government for the propagation and distribution of indigenous and exotic useful and ornamental trees and shrubs. About 500 species, selected according to their adaptability, have been introduced and are under cultivation. The methods of seeding and transplanting are described at some length. The present stock of seedlings is estimated at 600,000 plants, and during 1900 about 45,000 were distributed to municipalities, schools, and charitable and other institutions.

Algerian cork forests (*Jour. Bd. Agr.* [*London*], *8* (*1902*), *No. 4, p. 539*).—A brief note is given on the condition and output of the Algerian cork forests. The annual production has ranged from 86,000 to 100,000 cwt. per annum during the past 3 years. The cork tree only becomes profitable after having undergone a process of stripping the tree of its virgin bark. After this operation a fresh bark is grown, the aggregation of the annual growth forming the cork of commerce. About 10 or 12 years elapse between the time of the first stripping and the production of cork of marketable value. On account of the demand for cork of greater thickness, the Algerian Government has decreed a minimum thickness of 25 mm. for stripping the bark.

The palm trees of Brazil, J. C. BRANNER (*Pop. Sci. Mo., 60* (*1902*), *No. 5, pp. 387–412, figs. 25*).—Descriptions are given of a number of the palm trees which are found in Brazil, and their economic uses are described at some length.

The Douglas spruce as a park tree, E. ANDRÉ (*Rev. Hort.* [*Paris*], *74* (*1902*), *No. 10, pp. 225, 226, fig. 1*).—A description is given of a number of examples of the Douglas spruce (*Pseudotsuga douglasii*) in the parks of Europe, particular attention being called to specimens in Haute-Vienne. Notes are given on the growth of this tree and its habitat along the western coast of this country, and of its introduction into European sylviculture.

On some minor resources in connection with forestry, A. K. MYHRVOLD (*Tidsskr. Norske Landbr., 8* (*1901*), *No. 12, pp. 623–639*).

Frost checks and wind shakes, E. S. BRUCE (*Forestry and Irrig., 8* (*1902*), *No. 4, pp. 159–164, figs. 5*).—The author attempts to point out the relation between frost checks and the so-called wind shakes which occur in timber, and which are not generally understood. The conclusion is reached that the greater part of the so-called wind shakes in timber is in reality primarily due to frost. Two forms of frost checks are described. One crosses the annual rings in a radial manner and is due to contraction caused by frost. The other form, which is called expansion checks, extends in a circular direction, following along the annular rings. The first form extends from the outside of the tree inward, while the expansion checks do not show on the surface of the tree.

The use of anatomical characters in the identification of wood, H. STONE (*Nature, 65* (*1902*), *No. 1686, pp. 379, 380, figs. 2*).—The necessity of some means of identifying woods is commented upon, and the attempts of various authors along this line are indicated. The microscopical characters of a number of kinds of wood are described, and, based on the examination of wood of about 1,500 species, the author is convinced that the character of the medullary rays is the most constant feature and could be used as a basis of an artificial key for the determination of different kinds of timber.

Table of the U. S. Government forest reserves arranged by States (*Forestry and Irrig., 8* (*1902*), *No. 4, p. 152*).—A tabular summary is given of the forest reserves of the United States, their location and area. The grand total amounts to 46,327,969 acres, embraced in 13 States and Territories, there being 39 reserves at the time of the compilation of the table.

SEEDS—WEEDS.

A study on the germination and growth of Leguminosæ, especially with reference to small and large seed, F. G. MILLER and L. H. PAMMEL (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 133–159, pls. 5*).—Experiments are reported in which about 35 representatives of the family Leguminosæ were studied, equal lots of large and small seed being tested. Tabulated results of the germination tests are given and the rate of growth of some of the plants is also shown. While the number of experiments was so limited as to hardly warrant generalization, the results generally indicated the superior value of large seeds.

Some observations concerning the viability of red clover seed, S. HAMMAR (*K. Landt. Akad. Handl. Tidskr., 40* (*1901*), *No. 4, pp. 269–272*).

Weeds in general; two newcomers into Pennsylvania, W. A. BUCKHOUT (*Pennsylvania Sta. Bul. 58, pp. 8, figs. 2*).—A brief discussion is given of the distribution and means for eradication of weeds, and 2 species recently introduced in the State are recorded for the first time. These are the keeled garlic (*Allium carinatum*) and the Southern scabious (*Scabiosa australis*). The first species has quite recently been observed in one county of the State, and while still of very limited distribution its character for spreading would indicate that unless attention is paid to it it will soon spread to other regions. The characters of this plant are so similar to those of field garlic (*Allium vineale*) that the author believes it is liable to prove a troublesome weed over all the sections occupied by the last-named species. The second new weed has likewise been reported from but a single station. It apparently thrives best on low, wet grounds, and while not a prolific seed producer it has a vigorous root system, by which it can spread with considerable rapidity. While neither of these weeds is at present known to be a serious menace, they should be looked upon with suspicion and eradicated wherever found.

Two weedy plants new to America, L. R. JONES and A. W. EDSON (*Vermont Sta. Rpt. 1901, pp. 255, 256*).—Descriptions are given of the hoary alyssum (*Berteroa incana*) and the tuberous sweet pea (*Lathyrus tuberosus*). The hoary alyssum, which had not been previously reported from the United States, was first found at Burlington, Vt. It has since been found at a number of other places. The plant grows to a height of 1 or 2 ft., produces seed abundantly, and grows persistently in grass cut by a lawn mower. The tuberous sweet pea resembles the garden sweet pea, except in the smaller size of its flowers. It has been under observation for 10 years or more, and has continued to spread over the field where it was first noticed. When first discovered the land was in grass, but has since been cultivated with corn and potatoes, and is now reseeded, but the weed persists in the field, doubtless owing to its root stocks and tubers which were not destroyed by cultivation.

The bird vetch or wild pea, L. R. Jones and A. W. Edson (*Vermont Sta. Rpt. 1901, pp. 251–254*).—The bird vetch or wild pea (*Vicia cracca*) is frequently found in the meadows of Vermont and in some places is spreading quite rapidly. Wide differences in opinion regarding the plant have been expressed, some regarding it as a desirable forage plant, while others consider it a troublesome weed. A brief description is given of this vetch, and its value for pasture and hay are indicated. For the purpose of comparison the following table has been prepared in which the analysis of the bird vetch hay is compared with that of red clover hay:

Analysis of bird vetch hay.

	Original substance.		Crude ash.	Crude protein.	Crude fiber.	Nitrogen-free extract.	Ether extract.	Nitrogen.	Phosphoric acid.	Potash.
	Water.	Dry matter.								
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Bird vetch hay	7.30	92.70	6.33	12.92	29.83	48.72	2.20	2.06	0.42	1.90
Red clover hay	15.30	84.70	7.32	14.52	29.25	44.98	3.90	2.33	.45	2.60

The plant is said to be very deceptive, as an apparently dense growth when cut for hay gives a much smaller yield than timothy and much less than clovers. It tends to make the hay dark colored and musty, and is difficult of handling on account of its growth in tangled masses. It is said to be difficult to eradicate from most soils, but on the experiment farm it was killed by short rotation and clean cultivation. On the whole, the authors consider this vetch as a weed rather than a useful plant, and recommend its eradication.

The Canada thistle (Circium arvense), Samsö-Lund and E. Rostrup (*K. Norske Vidensk. Selsk. Skr., 1901, pp. 152*).

Killing weeds with chemicals, L. R. Jones and A. W. Edson (*Vermont Sta. Rpt. 1901, pp. 247–251*).—In continuation of previous work in this line, the authors tested carbolic acid, an arsenic-sal-soda mixture, arseniate of soda, and two trade preparations—Smith's Weed Killer and Henderson's Weed Destroyer. In 1900 further trials were made, in which sulphuric acid was tested, as well as carbolic acid and sodium arsenate. As a result of all the experiments, which are summarized, the authors conclude that walks, drives, tennis courts, and similar places can be kept free from weeds by the use of chemicals. The relative value of the chemical depends upon its immediate action as a herbicide and the persistence of its effect. When both of these factors were considered the arsenical compounds were found to be far superior to any other chemicals tried. Of the arsenical compounds tested, their efficiency in order of enumeration is as follows: Henderson's Fluid Weed Destroyer, arseniate of soda, Smith's Weed Killer, and arsenic-sal-soda mixture. The chief difference between these was found to be in the persistence of the effect, but all of them endured for a year or more. Considering the efficiency and cost, where small areas are to be treated and expense not considered, the authors would recommend Henderson's Weed Destroyer, since it is most convenient and most efficient. For larger areas, where convenience and economy are considered, the arseniate of soda is preferred. For killing weeds in lawns, where it is desired that useful plants shall occupy the soil as soon as possible, crude carbolic acid is preferred, since it is prompt in its action and does not permanently poison the soil. Sulphuric acid ranks next to this, but is less efficient. For destroying the orange hawkweed in grass lands salt continues to be the best herbicide tested.

On public measures for the eradication of weeds and other injurious plants, E. Korsmo (*Tidsskr. Norske Landbr., 8 (1901), No. 11, pp. 571–604*).

The eradication of prickly pear, G. Valder (*Agr. Gaz. New South Wales, 13 (1902), No. 1, pp. 59–62, pl. 1*).—An account is given of experiments conducted on a hedge of prickly pear which had formed a very dense growth of from 5 to 15 ft. in width. In the preliminary experiment, portions of this hedge were sprayed with a sodium arsenite solution and 2 trade preparations, and powdered sulphate of copper was injected into the fleshy stems. As a result of this experiment the sodium arsenite was found to be much more efficient than any of the others. The copper sulphate gave the poorest results, not completely destroying any of the plants. The sprayed plants all died to the roots but in a few months fresh shoots were developed. As sodium arsenite proved the most suitable of the remedies tried, experiments were conducted to ascertain the best strength of solution. As a result of these experiments the author recommends the use of 1 lb. of sodium arsenite to 10 galls. of water. This dissolves readily and is easily sprayed over the plants. The best time for spraying appears to be when the plants are most active, which is in spring or summer after heavy rains. The total cost of materials and applications is less than $10 per acre, even on very badly infested land. The action of the spray is rapid and within 24 hours the plants seem to be visibly affected. At the end of a week the fleshy stems had all turned brown and within 3 weeks or a month were sufficiently dry to burn readily. The effect of cutting or breaking the plants before spraying was tested but found to be without any advantage. A number of chemicals were injected into the basal joints of the stem of prickly pear, but aside from a local disturbance were without any appreciable effect. The substances so employed were sulphuric acid, carbolic acid, potassium oxalate, potassium ferricyanid, sodium arsenite, caustic potash, iron sulphate, and salt. Attention is called to the poisonous nature of the sodium arsenite when used as a spray. To avoid the risk of poisoning, cattle should not be allowed to graze where the treatment is being applied. After a week or 10 days little danger to stock need be anticipated. The author states that briars, lantana, thistles, and other weeds can be treated in a similar way to that recommended for the destruction of prickly pear.

DISEASES OF PLANTS.

Crop, orchard, and garden pests, T. W. Kirk (*New Zealand Dept. Agr. Rpt. 1901, pp. 317–326*).—A brief report is given on a number of the more common diseases of farm crops, orchard and garden products. Among the diseases of orchard trees a description is given of a disease called silver blight, which has been known for a number of years and which continues to spread throughout the country. This disease is readily detected as the foliage, usually beginning upon a single shoot or branch, is seen to assume a shiny, silvery appearance. Later other shoots and branches may be attacked or the disease may not spread farther. Experiments which have been conducted since 1894 led the author to suggest as remedial treatment cutting out of the affected branches and burning them when discovered. There seems to be evidence that the disease may be communicated by pruning implements, and on this account it is recommended that 2 knives should be employed, the first for pruning until the sound wood is reached, and the second to be used for cutting off a portion of the sound wood. The use of 2 knives may be dispensed with if the pruning knife be sterilized before making the final cut. The application of iron sulphate to the roots of the plants seems to be beneficial in improving the general condition of the trees.

A preliminary note on the cause of flax-sick soil, H. L. Bolley (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 42–46*).—A preliminary report is given on the cause of a disease of flax which is designated as flax sickness. This disease manifests itself after a few years of continuous cropping to flax, the soil being said to become flax sick. Investigations of the soil show that there has been no exhaustion of soil fertility, and further investigations have shown that it is due to the development of a soil fungus, *Fusarium lini*. The behavior of the fungus toward the host is briefly described, and the details of the life history of the parasite are to be published in a future station bulletin.

Flax wilt and flax-sick soil, H. L. Bolley (*North Dakota Sta. Bul. 50, pp. 27–60, figs. 18*).—A preliminary account of the flax wilt is given above. In the present bulletin the author reviews the distribution of this disease and the various theories as to its cause. At present it is reported from a dozen or more localities in North Dakota, as well as from adjacent States. The appearance and characteristics of the disease are described, from which it appears that plants are attacked at all ages and die early or late according to the time and intensity of the attack. Young plants wilt suddenly and soon decay if the weather becomes moist, while older ones which have become woody take on a sickly yellowish appearance, wilt at the top, and slowly die. An examination of the roots shows that the smaller branches are dead, as well as the lower part of the tap root. The diseased roots have a characteristic ashen-gray color, and many of the mature plants show the dead gray tissue only on one side of the tap root.

A series of experiments is reported showing that soils infested by the fungus have not lost their fertility, nor accumulated chemical substances which are detrimental to the flax, as has been frequently claimed. As previously stated, the cause of this disease is a fungus parasite, to which the name *Fusarium lini* is given. The life history of the fungus so far as known is described, and it is said that while living normally as a saprophyte it attacks the flax through the young tissues of the seed, leaves, stem, or roots. The means of spreading the disease were investigated, and it was found that it can be readily introduced by particles of soil, dirty implements, through seed, etc.

Experiments were conducted to ascertain means for seed treatment, from which it was found that the seed could be advantageously treated with a formalin solution of 1 part to 330 parts of water. A number of other chemicals were tested, and among them copper sulphate and corrosive sublimate proved effective, but possessed no advantage over the formaldehyde treatment.

In treating flaxseed the author calls attention to the necessity for having the seed thoroughly cleaned before treatment, and applying the solution evenly and only enough to dampen the surface of the seeds, after which they should be thoroughly stirred and dried immediately. From the author's investigations there seems to be little possibility of finding any substance which would destroy the fungus in the soil without injuring the germinating crop. On this account crop rotation seems to offer the best solution of soil treatment.

Potato diseases and their remedies, L. R. Jones and A. W. Edson (*Vermont Sta. Rpt. 1901, pp. 227–235*).—The authors report on experiments for the control of potato blights as they occurred in 1900, and potato-scab experiments of 1901. The summer of 1900 is said to have been unfavorable to the development of the fungus. There was a considerable amount of early blight, but the late blight and dry rot were almost entirely absent from the station fields. This is attributed to the use of clean seed and spraying. In the spraying experiments the efficiency of several fungicides and their use at different dates was tested. Standard Bordeaux mixture and 2 trade compounds, known as Boxal and Bodo, were tested. The Bordeaux mixture to which Paris green was added gave the best results. Rows of potatoes which were sprayed twice with this mixture yielded at the rate of 285 bu., and gave an increase of about 60 bu. over the yield from control rows. The fungicide known as Bodo compared favorably with standard Bordeaux mixture, while the third was not as efficient as either of these two. Boxal is primarily an insecticide and was not used early enough to compare its merits with those of Paris green.

The relative value of applications at different dates was tested, the sprayings being made July 2 and 16 and August 4 and 23. No difference was observed in any of the rows until after the third spraying. Soon after this time those plants which did not receive the application of August 4 were badly affected by tip burn, and the stems of many died. The fourth spraying did not appear to make much difference in the character of the foliage. Those plants that had received only the first and second sprayings were severely affected by disease, and those which received the third application continued to thrive whether they received the fourth application or not. The greatest yield obtained was from the plants receiving the four applications.

In the experiments with potato scab the seed was disinfected with corrosive-sublimate solution, formalin, formaldehyde gas, formalin vapor, sulphur fumes, sulphur, and bran, the latter being used at the request of several potato growers, it having been stated that trials where bran were used showed that it not only served to prevent scab, but at the same time was a good fertilizer. The results of the different treatments are shown, from which it is apparent that the corrosive-sublimate solution and the formalin solution were both practically successful in preventing scab and were of about equal value. When the ease of application of the formalin solution and the poisonous nature of the corrosive sublimate are considered, the former is preferred. None of the other applications were of practical success. The sulphur gas and formalin gas, which were both considered promising in the previous year's work, are considered without practical value and cannot be recommended for field use. The formalin vapor and wheat bran were so evidently valueless as to deserve no further trial.

Diseases of sugar cane in Bengal, A. T. GAGE (*Agr. Ledger, 1901, No. 5 (Crop Disease and Pest Ser., No. 5), pp. 71-96, pl. 1*).—A report is given of an examination of a large series of diseased sugar canes which had been collected from a number of different regions. Of 79 sets examined, 10 were affected with the fungus *Colletotrichum falcatum* alone, 7 were infested with the beetle *Dinoderus minutus*, while the remainder showed both fungus and beetle associated in the destruction of the cane. The percentage of disease observed varied from 1 to 75 per cent, with an average of about 23.5 per cent. The author is inclined to believe that the beetle is more destructive to cane than the fungus.

The dying of the cane in the fertilizer test garden, J. D. KOBUS (*Meded. Proefstat. Oost Java, 3. ser., 1901, No. 30, pp. 11*).—The object of this experiment was to determine whether any connection exists between fertilizers and root rot. Plats were fertilized with sulphate of ammonia, stable manure, sulphate of ammonia and stable manure, and with various native fertilizers made from Arachis, Ricinus, and Eriodendron. These fertilizers are highly nitrogenous, containing, respectively, 6.1, 5.2, and 4.6 per cent nitrogen.

When root rot made its appearance, the plants on the stable manure and sulphate of ammonia plats were first and most affected. These plants sent up many more shoots than those on the other plats, but owing to the disease the total product of these plats, was but slightly greater than that of the others. The sugar content of the sap was markedly less on these plats than on those fertilized with sulphate of ammonia alone. It appears from the above that the application of large amounts of organic matter increases the tendency toward root rot, and the author offers a hypothesis to account for this phenomenon. He observed that the plats near flowing water were more free from the disease than others, although no material difference could be detected either in the moisture content or in the amounts of organic matter present. He concludes, therefore, that the organic matter in decaying draws heavily upon the oxygen in the soil, and that the roots, first stimulated into great activity by the sulphate of ammonia, are deprived of the abundant supply of oxygen necessary for their health. When running water is near, the oxygen is renewed from the fresh water, and it is the oxygen rather than the moisture that is beneficial.—H. M. PIETERS.

Beet-root tumor, M. C. COOKE (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 1, pp. XLV, XLVI*).—The presence of globose tumors of about the size of an orange, on the side of beets, attached to the root by a narrow neck, is reported. When cut, the substance of the tumor seems to be not unlike that of the root. It is believed to be caused by the fungus *Œdomyces leproides.* Hitherto reported from North Africa, it now is known to occur in England. So far there has been no production of spores, and it is thought that this may be due to the effect of climatic conditions arresting the growth.

Disease in turnips and swedes, R. S. MACDOUGALL (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 14* (*1902*), *pp. 244–263, figs. 6*).—In August, 1900, the author's attention was called to a disease of turnips and swedes that was proving very destructive in the south of England. Upon examination it was found to be due to bacteria (*Pseudomonas destructans*), the disease being the same as that previously described (E. S. R., 13, p. 467). The effect produced by the organism is described at considerable length. The organism was isolated and cultivated through various media, and by inoculation proved to be the cause of the disease. As possible means of combating this rot the author recommends the destruction of diseased plants, lengthening the period of rotation, and rendering the conditions as favorable for crop production as possible.

The destruction of cell walls by bacteria, E. F. SMITH (*Abs. in Science, n. ser., 15* (*1902*), *No. 376, p. 405*).—Experiments are reported in which the destruction of the inner tissues of the turnip by the organism *Pseudomonas campestris* is shown. A study of diseased tissue shows that the bacterial masses occupy a considerable proportion of the host when in advanced stages of destruction, and cavities are formed by the solution of cell walls, some of them representing places formerly occupied by hundreds of cells. The cells are crowded apart by the growth of bacteria, the middle lamella first disappearing, but in a short time the cell walls become very faint in outline and finally disappear.

Formalin treatment for grain smuts, R. S. SHAW (*Montana Sta. Bul. 32, pp. 25, 26*).—A brief report is given of results of 3 years' work with formalin for the prevention of smuts of wheat, oats, and barley. Formalin has proved more easily applied and more efficient than any other fungicide tested. It is used upon the seed grain at the rate of 1 pt. of formalin to 40 galls. of water. The seed may be treated either by dipping in the solution or sprinkling over piles of seed, the grain to be well stirred to increase the thoroughness of application.

Concerning the parasitism of Botryosporium, V. PEGLION (*Ztschr. Pflanzenkrank., 11* (*1901*), *No. 2–3, pp. 89–92*).—The author reports the occurrence of the fungus Botryosporium upon leaves of wheat grown in pots in the laboratory. A study of the fungus seemed to show that it was identical with *B. pulchrum.* This led to a study of the related species of the genus and their parasitic habits. The author believes that a number of the species which have been described are identical. As a result of his inoculation experiments it is claimed that *B. pulchrum* can only attack plants that have been weakened by nematodes or other causes.

Disease of ginger in Jamaica (*Bul. Bot. Dept. Jamaica, n. ser., 8* (*1901*), *No. 11–12, pp. 180–182*).—A report is given of the disease which attacks ginger roots and is known as the black rot. This disease is well known and may be recognized by the sickly yellow foliage and black and decaying stems, and the rhizomes when dug will be found black and decaying. Intelligent growers are said to dig up the affected plants and the healthy ones growing near them and destroy them, also turning the soil so as to expose it to the sun. An examination of the rhizomes showed an abundant fungus mycelium which from its spore formation resembles *Allantospora radicicola*. Further studies will be required to demonstrate the specific relations of the fungus. As a precautionary measure, it is recommended that the rhizomes should be washed and soaked for half an hour in Bordeaux mixture prior to planting.

The asparagus rust, V. H. DAVIS (*Agr. Student, 8 (1901), No. 3, pp. 57–60*).—The occurrence of the asparagus rust in the gardens connected with the Ohio State University is noted. The 1-year-old plants began to show the effects of the disease about the middle of August, and by the first of September the old beds showed the signs of a general attack of the fungus. Various suggestions are given for the prevention of the disease, quotations being made from experiment station publications.

Cucumber leaf disease, M. C. COOKE (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 2–3, p. CXLIV*).—The author reports having received badly affected cucumber leaves which contained a fungus which has been previously described by him as occurring on melons under the name *Cercospora melonis*.

The prevention of onion smut, A. D. SELBY (*Ohio Sta. Bul. 131, pp. 47–51*).—In continuation of the experiments reported in Ohio Station Bulletin 122 (E. S. R., 13, p. 257), cooperative experiments were conducted upon 3 tracts of smutted soil devoted to onion growing. The effect of soil treatment of 2 strengths of formalin solution and 2 different rates of lime was tested. The results obtained demonstrated the value of dilute formalin solutions and of heavy applications of ground lime for the prevention of onion smut in infected soils. The formalin should be used at the rate of 1 lb. to 25 to 30 galls. of water, applied to the seed and then covered with earth. If the lime treatment is adopted, 75 to 125 bu. per acre of ground quicklime should be applied just before seeding.

A peculiar rotting of Greening apples in 1900, L. R. JONES and A. W. EDSON (*Vermont Sta. Rpt. 1901, pp. 235–237*).—During the autumn of 1900 a peculiar rot of Greenings was reported after the apples had been put in storage. The trouble was common throughout a considerable portion of the orchards in the Champlain Valley. The affected apples exhibited small, clearly defined, brown spots which gradually increased in size. When the spots attained a diameter of about half an inch, a white fungus growth appeared in the center which gave to the apple a very peculiar and marked appearance. This fungus proved to be the blue mold which is a common ripe-rot fungus of apples. The mold is not believed to be able to attack the uninjured fruit, and careful examinations showed the presence of the apple-scab fungus in the center of the rotting spots. It is believed that the peculiarly moist weather of the latter part of September led to the unusual development of small scab spots. This condition of weather, following a very dry summer, was unfavorable to the development of the fruit, and the scab fungus prepared the way for the invasion by the mold which was the immediate cause of the decay. The combination of conditions which made it possible for the attack of this fungus was unusual and will probably not occur again soon. If it could have been foreseen, the trouble might have been prevented by a single application of fungicide late in the season.

Peach-leaf curl and its treatment, G. QUINN (*Jour. Agr. and Ind. South Australia, 5* (*1901*), *No. 4, pp. 329, 330*).—A report is given on experiments conducted to combat the peach-leaf curl due to attacks of *Exoascus deformans*. During the previous season the disease is reported to have been very severe. At the beginning of the season reported upon the trees were thoroughly sprayed with Bordeaux mixture, and as a result entire immunity seems to have been secured to those trees receiving the application of the fungicide. Of the trees not sprayed a decided difference in susceptibility to the fungus is reported. In all, 40 varieties of peaches are reported upon, of which about half are classed as resistant.

A Monilia-like disease of sour cherries, ADERHOLD (*Ztschr. Pflanzenkrank., 11* (*1901*), *No. 2–3, pp. 65–73, pl. 1*).—A description is given of a disease of sour-cherry trees that has been under investigation since 1898. The general characteristics are those exhibited in an attack of *Monilia cinerea* on the cherry, but the fungus seems quite distinct. Subsequent studies showed that the disease was caused by an undescribed species of Fusarium, to which the author has given the name *Fusarium gemmiperda*, n. sp. Inoculation experiments are reported which seem to establish the parasitism of the fungus, and the author points out the apparent relationship that exists between the amount of rainfall during the period of flowering and the destructiveness of the disease. In 1899 there were but 2 days between April 15 and May 15 on which no rain fell, and the disease proved very destructive, while in 1900, with only 13 rainy days and about one-fourth the rainfall of the previous year, the disease did little damage. It is believed that during the years of normal rainfall this disease will not prove troublesome.

A disease of plums and cherries, M. C. Cooke (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 2–3, pp. CXLII, CXLIII*).—The author reports examining the plum, cherry, and other orchard trees, in which he found a white mycelium growing between the bark and the wood, ultimately destroying the tree. This is presumed to be the mycelium of some agaric, probably growing in the vicinity of the tree. No fruiting organs having been observed, it was impossible to determine the species, but *Collybia fusipes* was growing near by, and it is thought to be probably the cause of the disease.

Cherry diseases, W. Carruthers (*Jour. Roy. Agr. Soc. England, 62* (*1901*), *pp. 241–247, figs. 7*).—An account is given of a leaf disease of cherry, due to *Gnomonia erythrostoma*. This disease has been previously noted (E. S. R., 13, p. 567). In addition to the foregoing, an attack of *Cladosporium epiphyllum* upon cherries is noted. This fungus causes small brown specks upon the fruit, and while the growth appears to be entirely superficial the development of the fruit under the spots is arrested. The fungus also grows on the dead leaves which are quite prevalent as a result of attacks of the disease first described. A third disease, due to *Exoascus cerasi*, which produces distorted branches on the cherry tree, known popularly as witches' brooms, is described. Miscellaneous notes are given on a number of other plant diseases, the principal of which are due to attacks of *Botrytis parasitica* and *Sclerotinia sclerotiorum*.

Silver leaf, M. C. Cooke (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 2–3, pp. CXXXVI, CXXXVII*).—The author states that there is no essential relation between gumming and the so-called silver-leaf disease of peaches, plums, etc. He suggests that the silver leaf is possibly a modification of the disease known in the United States as peach yellows and recommends that the treatment here employed for the eradication of peach yellows be adopted for the prevention of the spread of silver leaf.

Silver leaf (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 1, p. 252*).—This disease is said to attack all species of the Prunus tribe, being particularly troublesome to peaches and plums. It is called silver leaf because of the silvery or ashen appearance of the surface of the leaf, which seems to be due to a separation which takes place between the outer skin of the leaf and its inner substance and a thin film of air separating them. What causes the separation is as yet unknown. It attacks trees in apparently robust health, spreading from twig to twig until at last it destroys the entire tree. At present the only means for preventing the spread of the disease is the complete destruction of trees which are affected.

A disease of the black locust, H. von Schrenk (*Rpt. Missouri Bot. Gardens, 12* (*1901*), *pp. 21–31, pls. 3*).—Detailed descriptions are given of a disease of black locust (*Robinia pseudacacia*), which is caused by the fungus *Polyporus rimosus*. A preliminary note of this disease has already been given (E. S. R., 13, p. 154).

The Botrytis disease of coniferous seedlings, J. Tuzson (*Ztschr. Pflanzenkrank.*, *11* (*1901*), *No. 2–3, pp. 95–98*).—A description is given of the attacks of *Botrytis cinerea* on spruce and larch seedlings, and comparisons are drawn between that species and *B. douglasii*, which has been described as occurring upon the Douglas spruce. The investigations of the author seem to indicate that the 2 species of Botrytis are identical.

A disease of betel-nut palms, G. WATT (*Agr. Ledger, 1901, No. 8* (*Crop Disease and Pest Ser., No. 6*), *pp. 129–180, pls. 3, figs. 4*).—An account is given of a disease of the betel-nut palm (*Areca catechu*) which has been under observation since 1896. The disease has been reported from a number of localities in India, and examinations of the infected material seem to show the almost total absence of fungi and bacteria as contributory causes of disease, although they were abundant in the decaying material. The author believes the disease is due to the formation of tyloses within the cells of the plant and the gradual breaking down of the cell walls. Thus far he has been unable to produce the disease under artificial conditions. Improved methods of cultivation and thorough soil drainage are recommended as possible remedies.

Cacao canker in Ceylon, J. B. CARRUTHERS (*Roy. Bot. Gard. Ceylon, Circ., 1. ser., 1901, No. 23, pp. 295–323*).—The cacao canker was first brought to general notice in Ceylon in 1896 and within a few years spread over a wide area, causing great destruction. Investigations by the author seem to show that the disease must have been present for a number of years prior to the sudden outbreak, as it is ordinarily of rather slow development. The disease attacks the stem and pods and is due to a species of Nectria. It has associated with it in some cases a species of Phytophthora. The results of a number of inoculation experiments are shown by which the definite cause of the disease is established. The treatment suggested is to cut out the cankered places in the trunk, shaving the bark, and burning the wood by holding to the exposed surface a vessel filled with hot coals or by some similar method. The diseased pods should also be collected and destroyed by burning or burying with lime. If these precautions are taken and persisted in, the disease can be held in check.

Some spraying experiments for 1901, L. F. HENDERSON (*Idaho Sta. Bul. 31, pp. 55–67*).—Spraying experiments were conducted for the prevention of the grape powdery mildew (*Uncinula spiralis*). This fungus has been noted as doing considerable damage to grapes for a number of years, in some localities destroying nearly the entire crop. The experiments were conducted with Bordeaux mixture, ammoniacal copper carbonate, and potassium sulphid solutions. Of the fungicides used, Bordeaux mixture gave the best results. The Bordeaux mixture, prepared with 6 lbs. of copper sulphate, and 4 of lime, to 45 galls. of water, was injurious to the tender leaves and vines, but where equal amounts of lime and copper sulphate were employed no injury was done. The experiment shows that sprayings should be continued as late as August or the middle of September for the best results. The rows treated with sulphur were not as free from mildew as those treated with ammoniacal copper carbonate, and those treated with potassium sulphid were more affected by disease than the others. The American varieties of grapes were found to be little subject to the powdery mildew in Idaho, while of the European varieties the Black Moroccos and Black Hamburgs were most subject to disease and the Flame Tokays and Malagas the least.

A spraying experiment was conducted for the control of peach-leaf curl, in which Bordeaux mixture and the lime, sulphur, and salt wash was tested. The lime-sulphur-salt mixture as a fungicide proved effectual in reducing the amount of peach-leaf curl, and incidentally proved that the lime and sulphur would destroy the San José scale without the salt additions. It is believed doubtful whether salt is of any material benefit in this mixture.

Spraying for grape rot, A. D. SELBY and J. F. HICKS (*Ohio Sta. Bul. 130, pp. 29–41*).—In continuation of the experiments reported in Bulletin 123 of the station (E. S. R., 13, p. 259) experiments have been conducted for the prevention of grape rot. Bordeaux mixture, ammoniacal copper carbonate, and soda-Bordeaux mixture were tested, all the sprayed vines receiving 4 applications of Bordeaux mixture, followed with 3 of ammoniacal copper carbonate on 1 portion and the other with 3 applications of soda-Bordeaux mixture. In all about 12 acres of vines were sprayed, at a cost of $7.10 per acre. The grapes from the unsprayed area were sold at $5.90 per acre, while the average return from the sprayed areas was $125.21 per acre. Comparisons between the ammoniacal copper carbonate and the soda-Bordeaux mixture are drawn, from which it appears that the soda-Bordeaux mixture is to be preferred to the other. A warning is given against the use of eau celeste, as it is not as efficient as the other fungicides and frequently causes injury to the foliage. In continuation of the experiments in 1900 on the number of sprayings required, the results obtained were more or less conflicting. The sprayings should, as a rule, be made at weekly intervals from the close of the flowering period until there is no danger from loss. As a rule, from the experiments which have been conducted by the station, the author thinks that it is demonstrated that grape rot, which has almost destroyed the grape industry in parts of Ohio, may be prevented, and that the future for the grape growers is much brighter than for a number of years past. Directions are given for the making of the soda-Bordeaux mixture and for the testing of the caustic soda which is used in its preparation.

The relation of grape spraying to public health, A. D. SELBY (*Ohio Sta. Bul. 130, pp. 42–46*).—At the suggestion of the State Dairy and Food Commissioner of Ohio, the author has prepared a statement relative to the use of fungicides as affecting public health. A number of analyses were made of grapes which had been thoroughly sprayed in the experiments for control of the grape rot, and the highest amount of copper obtained was 0.0004 gm. to 100 gm. of berries. This amount was so small as to be hardly worth consideration. The effect of copper compounds on wine fermentation is commented upon, the author quoting from foreign authorities which show that there is no danger to be apprehended, the fermentation either removing the copper or rendering it insoluble and without any importance in wine. An experiment was conducted with sprayed grapes in which jelly was made from a lot of grapes which had been heavily sprayed and which would ordinarily be rejected in the market as improperly sprayed. One hundred gm. of grapes and stems contained 0.00084 gm. of copper. When made into jelly 100 gm. of the incinerated jelly yielded 0.00018 gm. of copper. The grapes in this case were very ripe and both the grapes and stems were cooked together. Had the green berries been used or the stems removed the amount would have been much smaller.

The meteorological conditions requisite for injurious fungi, K. SAJO (*Prometheus, 13 (1901), Nos. 633, pp. 132–135; 634, pp. 154–157*).—The relation existing between outbreaks of powdery mildews, Peronospora, white rot, etc., and the atmospheric conditions are pointed out. The direction of long-continued winds is said to aid materially in spreading these diseases. The observations cover the period from 1895 to 1901.

Experiments with the fungicide sulfurin, K. MOHR (*Ztschr. Pflanzenkrank., 11 (1901), No. 2–3, pp. 98, 99*).—This fungicide, which has been highly recommended for use in protecting grapes against the powdery and downy mildews, is said to be calcium disulphid. This material the author has tested in connection with a number of diseases, and, based upon 10 years' experiments, he strongly recommends it for the prevention of the powdery and downy mildew of grapes, grape anthracnose, peach curl, and apple and pear scab, as well as a number of diseases of roses and other plants.

The meteorological conditions for the development of mildews, K. SAJO (*Ztschr. Pflanzenkrank., 11 (1901), No. 2–3, pp. 92–95*).—It is said that the powdery mildew (*Oidium tuckeri*) made its appearance in a certain part of Hungary in 1899, and the downy mildew (*Peronospora viticola*) in 1900. The meteorological conditions for both years from April to August are shown, from which the author concludes that for the best development of the powdery mildew cool weather and a low degree of moisture are necessary, while for the downy mildew a higher temperature and greater amount of moisture are required.

Lily fungi, M. C. Cooke (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 2–3, pp. CXXVIII–CXXX*).—A brief review is given of some of the more important parasitic fungi which attack cultivated lilies. Among those described are *Botrytis elliptica; B. canescens; Rhizopus necans; Æcidium convallariæ*, which ordinarily occurs on lilies of the valley and has also been reported on *Lilium canadense* and on Martagon lilies; *Uromyces lilii;* Phyllosticta, etc. The only fungus which is thought of particular injury to lily cultivation in England is the Botrytis, and most of the so-called "lily disease" is due to this organism.

Iris-leaf blotch, M. C. Cooke (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 2–3, pp. 450, 451*).—A brief account is given of the occurrence of *Heterosporium gracile* on the foliage of *Iris germanica*. The leaves become spotted with elliptical oblong reddish spots which enlarge and finally become confluent and the whole surface of the leaf becomes brown and dead. This disease has caused considerable injury in some parts of England, and the author recommends thorough spraying with ammoniacal copper carbonate for its prevention.

A snowdrop disease, G. Massee (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 1, pp. 41–46, fig. 1*).—A description is given of a disease which is caused by attacks of *Botrytis cinerea* on the snowdrop. The young leaves and flowers are attacked by the fungus just below the surface of the soil, and by the time they emerge above ground they are much distorted and covered with a dense brownish mold. This attack often occurs when the ground is covered with snow, and the leaves and flowers soon fall to the ground and the bulb, in many instances, is reduced to a soft pulp. The relationship of this disease with other diseases is indicated, and as practical measures for the prevention of the disease the author recommends the removal of soil overlaying the plants during the winter and application of fresh uninfected soil. It will also be found advantageous to mix lime with the newly added soil wherever this is practicable.

A review of the literature relating to plant protection during 1900, M. Hollrung (*Jahresbericht über die Neuerungen und Leistungen auf dem Gebiete des Pflanzenschutzes. Berlin, 1902, pp. 291*).—After reviewing the organization and means taken for combating plant diseases in different countries, the author reviews the literature of fungus diseases and insect enemies of plants, the subjects being arranged according to the host plant. A review is also given of the natural and artificial means adopted for combating these pests, and an annotated list is given of papers relating to the subject which appeared during 1900, many of the articles being abstracted in the report.

ENTOMOLOGY.

Miscellaneous notes on injurious insects, II, V. H. Lowe (*New York State Sta. Bul. 212, pp. 25, pls. 9*).—Notes are given on the life history, habits, and means of combating the periodical cicada (pp. 3–16). A large brood of the periodical cicada is expected in various parts of New York during the spring, and the species is therefore described in its various stages for the purpose of making fruit growers familiar with the insect. The methods of controlling the insect are not well developed. As a rule nothing can be done in the way of a direct remedy against its injuries. Small trees, shrubs, and vines may be protected by covering them with wire netting or other similar material.

The palmer worm (pp. 16–22), which caused quite widespread destruction in apple orchards in 1900, is reported to have nearly disappeared. A few were found in several orchards and in rare instances trees were found quite badly infested. The insect is described in its various stages and an account of its feeding habits is added from observations made in Kansas by P. J. Parrott. The observations made in 1900 showed that it was a comparatively simple matter to control this insect by spraying.

White grubs attacking aster plants (pp. 22, 23). The larvæ of *Lachnosterna fusca* are reported as causing considerable destruction of asters which were grown on land on which nursery trees had been raised during the previous year. The aster plants showed the first signs of injury about the middle of July, and began to wilt and died. As many as 4 grubs were found at the roots of a single plant. The only remedy attempted was the removal of the asters and destruction of grubs. A short rotation of crops is recommended for the purpose of preventing the too extensive infestation by these insects.

Papilio asterias was unusually numerous in the vicinity of Geneva during 1900–1901, and caused great destruction of celery, especially in the seed bed. A brief description is given of the insect in its different stages. The caterpillars of this species are seldom numerous enough to cause great injury, but if they are abundant they may be held in check by jarring from infested plants or by hand picking. Spraying with arsenical poisons is an effective method. For this purpose Paris green may be used at the rate of 1 lb. to 150 galls. of water, with the addition of enough lime to make the mixture somewhat cloudy.

Four lesser insect enemies, F. H. HALL and V. H. LOWE (*New York State Sta. Bul. 212, popular ed., pp. 12, pls. 2*).—A popular summary of the above bulletin.

First report of the State entomologist, W. E. BRITTON (*Connecticut State Sta. Rpt. 1901, pt. 3, pp. 227–278, pls. 11, figs. 2*).—This article contains a copy of the insect pest law passed by the legislature of Connecticut which went into effect July 1, 1901. The duties of State entomologist are briefly outlined. An attempt will be made to inspect all nurseries in Connecticut between September and October, and orchards, gardens, storehouses, and greenhouses will be inspected at any season of the year when convenient. Bulletins 135 and 136 of the station, relating to San José scale, are reproduced, with slight changes and corrections (E. S. R., 13, pp. 776,970).

During 1901 carnations were greatly injured by the variegated cutworm. The chief point of attack was on the unopened buds. Brief notes are given on the habits and life history of this species, with especial reference to the possibility of its becoming injurious in greenhouses. The elm-leaf beetle is reported as having been unusually abundant during the season and recommendations are made concerning the most efficient remedies to use against this insect. Hickory trees were much injured by *Scolytus quadrispinosus.* The beetles bored holes in the axils of compound leaves. The trunks of dead and dying trees constituted the breeding ground of the beetles and the insects were found in all stages in such situations. Apparently no direct remedy can be used against this insect. It is suggested that arsenical sprays be attempted in cases of unusual outbreaks. The fall webworm was very abundant during the year and defoliated a large number of trees of all kinds. Brief notes are given on the habits of this species.

In experiments with common soap as an insectcide it was found that ¼ lb. dissolved in 1 gall. of water destroyed the insects on chrysanthemums, but injured some of the plants. After diluting the mixture one-half, carnation plants infested with red spider were sprayed with satisfactory results. A tomato house badly infested with white flies was largely freed from this pest by the use of soap and water. Many other remedies had been tried, but none were more effective than this.

Brief notes are also given on the following: *Empretia stimulea, Phobetron pithecium, Œdemasia concinna, Datana ministra, D. integerrima, Chrysomela elegans, Papilio cresphontes, Vespa crabro,* green pea louse, pear psylla, tulip-tree scale insect, snowy tree cricket, and maple borer.

Report of the entomologist, R. A. COOLEY (*Montana Sta. Bul. 32, pp. 45–49*).—Brief notes are given on the habits and occurrence of *Phoxopteris comptana, Gymnonychus appendiculatus, Plutella cruciferarum, Aphis brassicæ,* and *Rhynchites bicolor.*

Report on injurious insects and plant diseases in 1901, W. M. SCHÖYEN (*Beretning om Skadeinsekter og Plantesygdomme i 1901. Christiania: Grondahl & Sons, 1902, pp. 42, figs. 26*).—During the season of 1901 an unusual amount of damage was caused by various species of injurious insects upon different crops. The greatest destruction of cereals was due to *Hydrellia griseola*, and to the common smuts and rusts. Meadows and pastures were more or less seriously injured by *Charæas graminis*, *Adimonia tanaceti*, crane flies, and *Phyllopertha horticola*. Cabbages and related cruciferous plants were considerably injured by attacks of *Meligethes æneus*, *Plutella cruciferarum*, *Mamestra brassicæ*, and *Limax agrestis*. Great injury was caused to apples by *Argyresthia conjugella*. This insect has caused the loss of a portion of the apple crop in Scandinavia for a number of years. Spraying experiments thus far conducted have proved ineffective in controlling this species. Notes are also given on *Aporia cratægi*, *Hyponomeuta variabilis*, *Eriocampa adumbrata*, pear psylla, apple aphis, currant sawfly, gooseberry fruit worm, *Cheimatobia brumata*, *Monophadnus bipunctatus*, and various species of insects injurious to domesticated animals and to food products and household furniture.

Insect attacks in 1901, R. S. MACDOUGALL (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 14 (1902), pp. 230–244*).—During the season of 1901 the author reports more or less serious damage done by a number of injurious insects. The pine beetle (*Hylesinus piniperda*) is described in its various stages and notes are given on its habits and life history. It was found that the egg stage extended over from 14 to 20 days, while the larval stage occupied about 8 weeks, and the pupal stage 2 weeks or more. In preventing injuries from this insect it is recommended that diseased trees be cut out and that fallen timber be removed. Good results are obtained by giving attention to trap trees, to which the beetles may be lured and in which they may subsequently be destroyed. The 2 chief insect enemies of this beetle are *Clerus formicarius* and *Rhizophagus depressus*. Notes are also given on another insect enemy of the pine, *Retinia resinella*. *Agrotis segetum* is reported as injurious to various root crops. The remedies recommended against this insect are trapping the moths during the summer months, hand picking the caterpillars, destruction of the caterpillars by harrowing, and scattering soot or lime about the base of the garden plants.

Notes are also given on *Plutella cruciferarum*, insects injurious to stored grain, *Hyponomeuta padellus*, and *Anobium domesticum*.

Insect pests attacking truck crops, F. W. MALLY (*Texas Sta. Bul. 64, pp. 18*).—In this bulletin a general account is given of the life history of the insects and of insecticides which are especially applicable in controlling insect injuries to truck crops in hotbeds, cold frames, and in the field. Special notes are given on the use of bisulphid of carbon, tobacco dust, kerosene emulsion, whale-oil soap, Paris green, arsenate of lead, the blast torch, bran mash, other poisoned baits, and Bordeaux mixture. Directions are also given for protecting certain crops from insect pests. These crops include cabbage, cauliflower, cucumbers, cantaloupes, watermelons, onions, potatoes, tomatoes, and squashes. The insects which are most injurious to these various crops in Texas are mentioned, with a brief description. Recommendations are made concerning the selection of spraying apparatus for use in combating these insects.

The onion thrips, F. M. WEBSTER (*Proc. Columbus Hort. Soc., 16 (1901), No. 1, pp. 74–80, pl. 1*).—The insect is described and mention is made of the plants upon which it usually feeds. Brief notes are given on its life history and natural enemies which serve to some extent in holding it in check. It is recommended that grass and weeds should be destroyed in the neighborhood of onion fields, so as to reduce the available breeding locations for this insect.

An eight years' study of chinch bug outbreaks in Ohio, F. M. WEBSTER (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 47–57, figs. 9*).—Brief descriptive notes explanatory of maps which show the distribution of chinch bugs for a period of 8 years in the different counties of the State.

The plant lice of sugar cane in Java, L. Zehntner (*Meded. Proefstat. Suikerriet West Java, 1901, No. 53, pp. 22, pls. 2*).—The author gives descriptive, biological, and economical notes on *Aphis sacchari*, *A. adusta*, and *Tetraneura lucifuga*.

Insect enemies to fruit, and their remedies, W. B. Smith (*Proc. Columbus Hort. Soc., 16 (1901), No. 1, pp. 58–62*).—Brief notes on the habits and life history of codling moth, apple-tree borer, apple-tree tent caterpillar, San José scale, plum curculio, peach borer, currant aphis, and other injurious insects. The approved remedies are mentioned in the discussion of each insect.

Insects injurious to fruit, A. H. Snyder (*Proc. Columbus Hort. Soc., 16 (1901), No. 1, pp. 54–58*).—The author presents brief notes on the habits, life history, and means of combating codling moth, round-headed apple-tree borer, apple-tree tent caterpillar, plum curculio, rose chafer, spring and fall cankerworm, May beetle, and other injurious insects.

Rhynchites minutus an enemy of the strawberry, J. Ritzema Bos (*Tijdschr. Plantenziekten, 7 (1901), No. 2, pp. 39–41*).—This species is reported as having caused injury to strawberries since 1897. The stems, which are attacked, wilt, and the leaves die. No successful remedies have been devised for combating this species.

Combating the root louse of gooseberry and currant by injections of benzine in the ground, J. Ritzema Bos (*Tijdschr. Plantenziekten, 7 (1901), No. 2, pp. 37–38*).—*Schizoneura grossulariæ* was not known as an injurious insect in Holland until within the past few years, when it has become quite important as an enemy of the gooseberry and currant. Experiments were made in 1900 to determine methods for destroying this insect. The use of either carbon bisulphid or benzine proved to be very effective when these substances were injected into the ground about infested bushes. All of the root lice were destroyed by a single application.

Report of the State entomologist, J. B. Smith (*New Jersey State Bd. Agr. Rpt. 1901, pp. 237–242*).—The greater part of the work of the State entomologist has been done in combating the San José scale. Notes are given on the practical working of quarantine laws and on the use of certificates of inspection. It is argued that San José scale can not be exterminated by artificial means but may be held in check by the use of appropriate remedies. It is stated that, as a rule, the owners of nursery stock and orchards have readily responded to directions given concerning treatment for injurious insect pests and that no resort to force has become necessary.

Report on the inspection of Roanoke County for the San José scale, W. B. Alwood (*Virginia Sta. Spec. Bul., 1901, Dec. 10, pp. 37, map 1*).—In this report the author gives a list of localities in Roanoke County infested with the San José scale. The total number of infested localities is reported as 636; the total number of infested trees as 4,144, and the number of trees in the infested orchards, 74,588.

Three common orchard scales, H. T. Fernald (*Massachusetts State Bd. Agr. Rpt. 1901, pp. 353–363, pl. 1, figs. 2*).—Brief descriptive and biological notes are given on oyster-shell bark-louse, scurfy scale, and San José scale. The food plants of these scale insects are mentioned and notes given on their distribution, natural enemies, and the treatment which is most effective against them. The insecticide treatments recommended include fumigation and spraying with kerosene, crude petroleum, and whale-oil soap, together with pruning of infested trees before spraying.

Treatment for San José scale, J. H. Stewart (*West Virginia Sta. Bul. 78, pp. 213–230, figs. 6*).—In this bulletin the author gives a popular account of the means of combating the San José scale, the conditions which are favorable for successful treatment, brief notes on the most effective insecticide treatments, and on spraying apparatus. The insecticide treatments which are recommended for destroying the San José scale include mechanical mixtures of kerosene and water, kerosene containing from 5 to 10 per cent of vaseline, kerosene mixed with vaseline and paraffin, crude oils, whale-oil soap, kerosene emulsion, fumigation, and the destruction of badly infested trees. The bulletin also contains a copy of the law recently enacted by the legislature of West Virginia on the subject of nursery inspection and the prevention of injury from insect pests and fungus diseases.

The oak scale insect, J. Ritzema Bos (*Tijdschr. Plantenziekten, 7 (1901), No. 5–6, pp. 141–145*).—*Asterodiaspis quercicola* is reported as attacking the native as well as introduced oaks in Holland. The injury from this species has not yet reached any alarming proportion, but attention is called to it in order that reports may be made and operations begun against the species if it becomes too numerous.

The oak flea-beetle (Haltica erucæ), J. Ritzema Bos (*Tijdschr. Plantenziekten, 7 (1901), No. 5–6, pp. 129–141*).—Notes are given on the habits and life history of this species of flea-beetle, which is reported as attacking a number of species of oak. The insect appears every year, but not always in large numbers. When the larvæ and beetles occur upon the leaves they may be destroyed by spraying with kerosene emulsion or with arsenical poisons, but these methods are ordinarily too expensive. A cheaper way of combating the insect consists in attacking the beetles during the winter. They may usually be found concealed in rubbish and in the cracks of old bark upon the trees, and by scraping off the loose bark and burning it, together with other rubbish, the beetles may be readily destroyed.

Insect enemies of the pine in the Black Hills Forest Reserve, A. D. Hopkins (*U. S. Dept. Agr., Division of Entomology Bul. 32, n. ser., pp. 24, pls. 7, figs. 5*).—In this bulletin a report is made on a study of the insect enemies of the rock pine (*Pinus ponderosa scopulorum*) in the Black Hills. The attention of settlers was attracted to the extensive destruction of this tree by insects about 1895. The species of beetle which is chiefly concerned in killing the pines is described as a new species, under the name *Dendroctonus ponderosa.* After the primary attack is made by this species, several other species of beetles may also set to work upon the trees and cause a more rapid death and decay. Among the latter species brief notes are given on the following: *Tomicus oregoni*, *T. calligraphus*, *T. cælatus*, *Dendroctonus valens*, *Hylurgops subcostulatus*, and *Hylastes porosus.* A number of small pine trees were dying apparently of other causes which were not definitely determined. Among the natural enemies of *D. ponderosa* special mention is made of *Trogosita virescens*, and certain other predaceous beetles and bugs. No parasitic insects of any importance were found preying upon the pine beetle, nor did parasitic fungi or birds appear to exercise any important influence in checking the work of the pine beetle.

According to the observations of H. E. Dewey and the author, the beetles migrate from dying trees in swarms during August, and settle on living trees, which they attack from near the base to the upper part of the trunk. The first indication of the infestation is the presence of red dust in the loose bark or at the base of the tree; this is followed by the appearance of numerous small masses of pitch on the surface of the bark. After the tree is once thoroughly infested other insects and fungi cause its rapid destruction. It appears that unless trees are cut within 2 or 3 years after they begin to die very little of value is left. The attack of this species is apparently becoming less serious.

The author recommends, in combating this insect, that the location and extent of infested areas be determined, after which the infested trees in these areas should be marked for cutting. Contracts for cutting trees should specify that only infested trees should be cut. An investigation of railroad ties which were cut according to contract on account of being infested with the insect, showed that only 55 out of 207 ties showed any evidence of having been attacked by the beetle. It is suggested that further experiments be conducted in cutting and removing the bark from infested trees, and in girdling and otherwise treating living trees so as to make them serve as traps for the beetles.

Some insect enemies of living trees, A. D. Hopkins (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 66–69*).—Brief notes on *Dendroctonus brevicornis*, *D. monticola*, *D. pseudotsugæ*, *D. piceaperda*, and other common insects injurious to forest trees.

The shade-tree insect problem, A. H. Kirkland (*Massachusetts State Bd. Agr. Rpt. 1901, pp. 77–107, pls. 6, figs. 8*).—This was a paper read before the State Agricultural Society and is concerned with a discussion of the habits, life history, and means of combating San José scale, elm-leaf beetle, gypsy moth, brown-tail moth, white-marked tussock moth, fall webworm, and imported willow weevil (*Cryptorhynchus lapathi*), together with notes on the more important insecticides for use in combating these insects.

Killing the eggs of the gypsy moth by means of kerosene, J. RITZEMA BOS (*Tijdschr. Plantenziekten, 7 (1901), No. 5–6, pp. 162–165, figs. 5*).—Brief notes are given on the use of kerosene in killing the eggs of this insect in masses on trees during the winter.

Report of committee on gypsy moth, insects and birds, A. PRATT ET AL. (*Massachusetts State Bd. Agr. Rpt. 1901, pp. 313–319*).—After the appropriation for insecticide operations against the gypsy moth was discontinued by the legislature, the gypsy moth commission was ordered to turn over all apparatus to other departments of the commonwealth or to sell the same. A considerable part of the apparatus was transferred to the Metropolitan Park Commission, office of the State Board of Agriculture, and the Massachusetts Agricultural College. It is reported that the gypsy moth is increasing in numbers throughout its range, in some localities to a serious extent. Much damage is also reported from the depredations of the brown-tail moth, elm-leaf beetle, and San José scale.

A new nomenclature for the broods of the periodical cicada, C. L. MARLATT (*U. S. Dept. Agr., Division of Entomology Circ. 45, n. ser., pp. 8*).—Reprinted from Bulletin 18, new series, of the division (E. S. R., 10, p. 1062).

General review of the animal and vegetable parasites of the cocoanut, A. ZIMMERMANN (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 25, pp. 914–924*).—The animal and plant enemies of the cocoanut are briefly mentioned, in connection with a bibliographical list of the literature relating to this subject. Notes are given on rats, squirrels, various families of beetles, ants, moths, bugs, grasshoppers, crustacea, and a number of fungi belonging to the various groups of this class of plants.

The small rose-leaf wasp (Blennocampa pusilla), J. RITZEMA BOS (*Tijdschr. Plantenziekten, 7 (1901), No. 4, pp. 126–128*).—This insect is reported as having caused injury to rose leaves throughout the Netherlands; both wild and cultivated species were attacked. As a rule, however, the injury is not of such importance as to require any special attention in combating it.

Certain Javanese Ascomycetes which are parasitic on Coccidæ, A. ZIMMERMANN (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 24, pp. 872–876, figs. 5*).—Descriptive and biological notes on the following species of fungi parasitic on bark lice: *Torubiella luteorostrata, Nectria coccidophthora, Lisea parlatoriæ, Ophionectria coccicola, Broomella ichnaspidis, Hypocrella raciborskii,* and *Myriangium durixi.*

South African locust fungus (*Agr. Jour. Cape Good Hope, 19 (1901), No. 13, pp. 850–855*).—A brief discussion is given of the various parasitic fungi which have been found growing upon injurious insects. The South African locust fungus has proved to be *Mucor exitiosus*, and was described by Massee as a new species. The fungus was first observed in 1896, since which time it has been found useful in controlling locusts and cockroaches.

Concerning certain mosquitoes, J. B. SMITH (*Science, n. ser., 15 (1902), No. 366, pp. 13–15*).—*Culex sollicitans* is considered the most common species in New Jersey. Observations show that the larvæ live only in brackish water; they were never found by the author in fresh water, and were observed in several instances in water which was 25 per cent saltier than sea water. Despite the fact that they breed only at the seashore, these mosquitoes are carried by the wind or migrate to distances of from 10 to 40 miles inland, where they may be found in large numbers. Notes are also given on *C. pungens.* Larvæ of this species were found until late in November. Species of Anopheles continue to breed until long after frost has occurred. On a few occasions adults were bred from larvæ that had been confined under ice for several hours. Observations of the author in New Jersey clearly indicate "that there is absolutely no connection between the abundance of Anopheles and the prevalence of malaria."

The mosquito pest and how it may be abated, J. B. SMITH (*New Jersey State Bd. Agr. Rpt. 1901, pp. 245–249*).—Brief notes are given on the prevalence and distribution of mosquitoes in New Jersey, including the 2 genera Anopheles and Culex. Stegomyia is said not to occur in New Jersey.

FOODS—NUTRITION.

Food and food adulterants, W. D. BIGELOW ET AL. (*U. S. Dept. Agr., Bureau of Chemistry Bul. 13, pt. 10, pp. IX+1375–1517*).—The process of canning different sorts of meats is described from personal observations. Analyses are reported of many samples of canned and fresh meat of different sorts, meat broth, etc., the methods of analysis being described. In addition to the constituents ordinarily determined in proximate analyses, determinations are reported of different members of the nitrogenous group. Special studies are also reported of the fat of different sorts of fresh and canned meat, as the authors believe an examination of the fat furnishes valuable means of determining the character and origin of such goods. Of the 290 samples of American origin, 6.2 per cent, and of the 69 samples of imported goods, 40.6 per cent, contained chemical preservatives. The authors found that meat undergoes shrinkage when parboiled previous to canning. It is stated that loss in weight "consists very largely of water and fat, partly of meat bases and ash, and that the amount of proteid matter removed would be so small as to be within the limits of error of analysis. The following table shows the average results obtained in the examination of the fats of different sorts of fresh and preserved meat:

Fats from roast and boiled meat.

	Canned roast and boiled beef.	Canned corn beef.	Canned dried and smoked beef.	Horse meat.	Canned ham and bacon.	Canned tongue.	Canned fowl (of known origin).	Canned fowl.	Potted beef.
Specific gravity at $\frac{100°}{100°}$	0.8953	0.8934	....	0.9067	0.8893	0.8929	0.8999	0.9003	0.8909
Specific gravity at $\frac{100°}{15°}$	.8589	.8572	....	.8699	.8533	.8565	.8633	.8635	.8634
Degrees butyro-refractometer	52.8	53.98	55.2	62.3	53.4	54	56.7	60.3	55.3
Index of refraction at 35°	1.4610	1.4618	1.4627	1.4673	1.4615	1.4628	1.4637	1.4660	1.4632
Melting point	40.1	40.14	39.3	29.7	27.7	35.8	31.2	32.4	37.4
Chilling point	32.2	31	26	17.2	20.3	26.7	19.6	21.7	28.2
Iodin number	45.6	42.7	54.1	66.4	57.8	48.79	76.1	64.63	47.8
Koettstorfer's number	194.8	196.3	....	201	193	193	198	195	188
Soluble acids, per cent	.45	.60	....	1.32	.98	.97	.51	1.69	.28
Insoluble acids, per cent	93.54	92.37	....	91.37	90.80	90.91	95.58	91.61	91.29
Heat with H_2SO_4 (deg. C.)	35.8	36.2	....	49.9	41.4	37.8	45.4	....	....

	Potted chicken and turkey.	Potted ham.	Potted tongue.	Mixed and miscellaneous potted goods.	Deviled meat.	Canned sausage.	Pâtés.	Miscellaneous meat dishes.
Specific gravity at $\frac{100°}{100°}$	0.9100	0.9036	0.8992	0.9082	0.8968	0.8953	0.9013	0.9033
Specific gravity at $\frac{100°}{15°}$	.8776	.8669	.8627	.8713	.8605	.8596	.8648	.8866
Degrees butyro-refractometer	58.2	54.1	55.1	56.5	55.5	54.6	55.0	56.9
Index of refraction at 35°	1.4646	1.4620	1.4627	1.4635	1.4629	1.4620	1.4625	1.4641
Melting point	35.3	34.8	33.9	35.9	32.9	35.2	34.1	36.4
Chilling point	20.6	24.2	24.8	23.6	20.7	22.3	23.5	24.6
Iodin number	54.4	....	53.3	52.1	57.2	55.0	50.9	50.6
Koettstorfer's number	197	198	194	193	197	193	197	196
Soluble acids, per cent	....	1.95	.61	.70	.75	.70	.55	1.10
Insoluble acids, per cent	89.32	89.03	92.93	92.33	92.97	90.76	93.00	91.00
Heat with H_2SO_4 (deg. C.)	48.8	40.2	....	....	....	40.0	....	....

Chemical analysis of a flour made from India corn, S. GRIMALDI (*Staz. Sper. Agr. Ital., 34 (1901), No. 10, pp. 952–965*).—Analytical data reported and discussed.

Flour from Arnautka wheat, E. F. LADD (*North Dakota Sta. Rpt. 1901, pp. 18, 19*).—An analysis is given of flour from this macaroni wheat.

The food value of starch, flour, and grits, P. CARLES (*Répert. Pharm., 57 (1901), pp. 289–291; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 1, p. 29*).—A general discussion.

Substitutes for bread used in times of famine and the digestibility of such materials by man, ERISMANN (*Ztschr. Biol., 42 (1901), pp. 672–709*).—The composition and digestibility of a number of sorts of bread substitutes used in Russia in time of famine are reported. Results are discussed at some length.

The amount of bread obtained from flour, BALLARD (*Compt. Rend. Acad. Sci. Paris, 133 (1901), p. 251; abs. in Centbl. Agr. Chem., 31 (1902), No. 3, pp. 186–188*).—The comparative yield of round and oblong loaves was studied. On an average the weight of the round loaves from a given quantity of flour was greater than that of the square loaves, the difference being due to the proportion of crust and the corresponding water content of the two sorts. Analytical data are also reported.

Adulteration of wheat flour with flour from other cereals and legumes, M. LOZANO Y CASTRO (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 16 (1901), No. 3, pp. 91–101*).—Directions for recognizing adulteration of different kinds are given.

A plant butter used as a substitute for cocoa butter, G. POSSETTO (*Giorn. Farm. e Chim., 51 (1901), pp. 337–340; Chem. Rev. Fett u. Harz-Ind., 8 (1901), p. 233; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 10, p. 472*).—From an examination of a sample the conclusion was drawn that this material consisted of Japanese wax and cocoa fat.

Gluten alimentary pastes, G. TEYXEIRA (*Staz. Sper. Agr. Ital., 34 (1901), No. 10, pp. 993–995*).—The author compares a number of different brands of gluten alimentary pastes, quoting the composition.

Fersan—its therapeutic and nutritive properties, H. F. TOURLET (*Thesis, Univ. Paris, 1901, pp. 61*).—Experiments are reported on the effects of feeding fersan, a food product made from the red corpuscles of beef blood.

Plasmon, E. F. LADD (*North Dakota Sta. Rpt. 1901, pp. 20, 21*).—Three preparations of this material were examined.

Infant foods, E. F. LADD (*North Dakota Sta. Rpt. 1901, p. 20*).—Analyses are reported of 4 preparations.

Food products of Canada and names of some exporters (*Dept. Agr., Ottawa, 1901, pp. 44*).—A description and statistical article with an address list.

An improved method of preparing and preserving meat for use in metabolism experiments, W. J. GIES (*Amer. Jour. Physiol., 5 (1901), No. 4, pp. 235–239*).—According to the author, meat may be satisfactorily preserved by grinding, removing moisture by pressure, forming the dry mass into balls, and storing in glass bottles at a temperature of 0° C. or lower. The advantages gained, the author states, are: "The perfect freshness of the food at the time of its consumption, even weeks after its preparation; therefore, its similarity in appearance, odor, and taste to ordinary fresh meat, and its superiority to forms of nitrogenous food to which the animal is unaccustomed, or for which it has no desire. The constancy of composition of the food throughout even the longest experiments, by which circumstance the labor of analysis is reduced to a minimum."

Recent investigations concerning dietary studies of the people of the United States of America, P. O. SMOLENSKI (*St. Petersburg: Department of Interior, 1901, pp. 128*).—This volume contains an account of the agricultural experiment stations of the United States, and a summary of all the nutrition investigations carried on to date under the auspices of the Office of Experiment Stations of the United States Department of Agriculture, the author's object being to familiarize Russian readers with the large amount of material which has been thus accumulated.

Dietary computer, Ellen H. Richards (*New York: John Wiley & Sons; London: Chapman & Hall, 1902, pp. 54, chart*).—This volume contains specially prepared tables showing the composition of a number of common food materials and dishes made from them. The material is arranged in such a way that the author believes the food value of a given menu may be readily computed and compared with the commonly accepted dietary standards. A chart accompanying the volume consists of a cardboard frame with movable slips upon which the composition of food materials may be written in such a way that the total food value of the day's ration can be conveniently ascertained.

Therapeutic value of vegetable diet, L. Kuttner (*Berlin. Klinik., 1902, Jan.; abs. in British Med. Jour., 1902, No. 2159, Epit., p. 79*).—The author concludes that a mixed diet is most suitable for man in health. The conditions requiring a partial or complete vegetarian diet are discussed.

The valuation of a vegetarian diet, Albu (*Berlin. Klin. Wchnschr., 1901, No. 24, p. 647; abs. in Hyg. Rundschau, 12 (1902), No. 5, pp. 237, 238*).

Metabolism on a vegetarian diet, Albu (*Ztschr. Klin. Med.* [*Berlin*], *43* (*1901*), *p. 1; abs. in Hyg. Rundschau, 12* (*1902*), *No. 5, pp. 237, 238*).—The author studied the diet of a woman who had been a vegetarian for 6 years. The daily diet, which consisted of graham bread, apples, plums, grapes, nuts, dates, and lettuce, furnished 34.14 gm. protein and 36 gm. fat. On this diet there was an average daily gain of 0.37 gm. nitrogen. On an average 67 per cent protein and 65 per cent fat was digested. The diet is discussed in relation to a normal diet.

Precautions to be taken by consumers of vegetables, Ceserole (*Queensland Agr. Jour., 10* (*1902*), *No. 4, p. 301*).—In an article quoted from Agriculture Moderne, the author recommends that vegetables should be well washed and immersed for ½ hour in a 3 per cent solution of tartaric acid to rid them of injurious micro-organisms and parasites and their eggs if such are present. He calls attention especially to the fact that injurious parasites may be transmitted to men by raw vegetables which have been manured with contaminated material unless they are thoroughly cleaned.

The energy value of the diet of man, M. Rubner (*Ztschr. Biol., 42* (*1901*), *pp. 261–308*).—Experiments are reported in which subjects (men and boys) were fed milk, potatoes, rye bread, coarse bread, meat, a mixed diet containing a little fat, and a mixed diet containing a large amount of fat. The fuel value of food, urine, and feces was determined. In a number of cases the fuel value of the food as determined was compared with the value calculated by the aid of the factors ordinarily used. The following table shows the physiological nutritive effect of the foods and rations studied—that is, the percentage of energy available:

Physiological nutritive effect of different foods.

Food material.	Fuel value per gm. ash-free material.	Energy lost.			Physiological nutritive value.
		In urine.	In feces.	Total.	
	Calories.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Milk	5,932	5.13	5.07	10.20	89.80
Mixed diet, containing an abundance of fat; boy E.	5,916	2.52	6.27	8.79	91.21
Mixed diet, containing an abundance of fat; boy O.	5,718	3.30	7.91	11.21	88.79
Mixed diet, containing little fat; man F	5,095	5.00	7.43	12.40	87.60
Mixed diet, containing little fat; man T	4,917	4.30	4.58	8.90	91.10
Mixed diet, containing an abundance of fat; man F	6,204	5.20	4.32	9.50	90.50
Mixed diet, containing an abundance of fat; man T	6,479	4.48	4.44	8.90	91.10
Rye bread	4,190	2.40	15.50	17.90	82.10
Coarse bread	4,243	2.20	24.30	26.50	73.50
Potatoes	1,178	2.30	5.60	7.90	92.10
Meat	5,862	16.30	6.90	23.20	76.80

The author notes that determinations like those reported furnish a means of judging of the energy value of foods, but that special studies of a different nature are needed to determine their protein value.

Meat and meat preparation in the diet of man, H. Poda and W. Prausnitz (*Ztschr. Biol., 42 (1901), pp. 377–406*).—Digestion experiments with man are reported in which roast meat, salt meat, and meat albumen, with and without the addition of meat extract, were added to a simple mixed diet. From a number of the experiments the following average figures were deduced, showing the amount of the different nutrients excreted in the feces—that is, not digested:

Nutrients excreted in the feces when meat and meat preparations were eaten.

Diet.	Dry matter.	Nitrogen.	Ether extract.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Meat albumen	4.10	10.27	22.87	4.52
Roast meat	3.33	7.12	19.14	3.68
Salt meat	3.26	6.79	10.04	4.76

Artificial digestion experiments were also made, which led to the conclusion that fresh meat was more quickly dissolved than the dry meat preparations, and that different preparations made by drying meat differed among themselves in the quickness with which they were dissolved. The experiments are discussed in detail.

The power of alcohol to protect protein, R. O. Neumann (*München. Med. Wchnschr., 1901, No. 28, p. 1126; abs. in Hyg. Rundschau, 12 (1902), No. 5, pp. 248, 249*).—From experiments in which the author was himself the subject, he concluded that under the experimental conditions alcohol was directly comparable with fat. He regards alcohol as a nutrient.

The cleavage of protein in man when severe work is performed, C. Jackson (*Atti R. Accad. Lincei. Rend. Cl. Sci. Fis. Mat. e Nat., 5. ser., 10 (1901), II, No. 8, pp. 186–188*).—Experiments are reported in which the urine of 5 persons was examined after severe work which consisted in climbing a mountain, the results being compared with similar data obtained when no work was performed. The author believes that muscular work increased the cleavage of protein. [It should be noted that no statements are made concerning the food eaten. The variations in the amount of nitrogen excreted may have been due to variations in the amount of protein consumed.]

Concerning the tryptic cleavage of protein, J. Mochizuki (*Beitr. Chem. Physiol. u. Pathol. Ztschr. Biochem., 1 (1901), p. 44; abs. in Hyg. Rundschau, 12 (1902), No. 5, pp. 235, 236*).—A chemical study of trypsin.

The influence of environment, and especially of inorganic substances, upon the properties of protein, J. Starke (*Ztschr. Biol., 42 (1901), pp. 187–227*).—A theoretical discussion of the structure and properties of the albumen molecule with special reference to the author's investigations.

ANIMAL PRODUCTION.

Commercial feeding stuffs in the Connecticut market (*Connecticut State Sta. Bul. 138, pp. 39*).—In accordance with the State feeding stuff law, analyses were made of a number of samples of cotton-seed meal; old and new process linseed meal; wheat products from winter, spring, and unclassified wheat, including bran, middlings, and mixed feeds; corn meal; gluten meal; gluten feed; hominy feeds; rye feed; malt sprouts; buckwheat shucks; buckwheat middlings; and miscellaneous feeds, including the by-products from cereal breakfast foods, proprietary feeds, condimental feeds, and meat meal, and other poultry feeds.

"Cotton-seed meal, linseed meal, the gluten meals and feeds, and the factory mixed feeds of two firms are, as a rule, sold with a guaranteed percentage of protein and fat as is required by the State law. On the other hand, the wheat feeds, and the corn feeds—other than those named above—as well as most other feeds, are, as a rule, sold without guaranties, which is contrary to law.

"The only evidence of deliberate fraud in the feed market which is shown by the analyses, is the mixing of finely ground corncobs with wheat feed. . . . There are in the feed market a considerable number of very inferior oat feeds, and mixed corn-and-oat feeds, which contain a large proportion of hulls and chaff, and which can not profitably be used by the stock feeder at any price.

"The dairyman's chief concern in buying feeds to supplement his farm supply of corn, stover, hay, etc., should be to buy, on the most reasonable terms, protein in digestible and palatable forms. Seldom will it pay him to buy any feed containing less than 12 to 15 per cent of crude protein."

Analyses of commercial feeding stuffs, J. L. Hills (*Vermont Sta. Bul. 91, pp. 39-52*).—Analyses were made in accordance with the State feeding stuff law of a number of samples of cotton-seed meal; linseed meal, old and new process; gluten meals, and feeds; cereal breakfast food by-products, and other commercial feeds; ground oats; wheat bran; wheat middlings; mixed wheat feed; buckwheat bran; buckwheat middlings; buckwheat hulls; calf meal; ground beef scrap and poultry feeds. According to the author none of the samples of cotton-seed meal, linseed meal, or gluten products was adulterated, although several brands of the latter and some of the germ oil meals were inferior to the guaranteed composition.

"The oatmeal manufacturers' brands of oat feeds, corn-and-oat feeds, etc., were found, as usual, more or less loaded with oat hulls. Some of these brands are extremely inferior. One is called a ground oats, yet carries less than half the protein which oats should contain. Another is nothing more nor less than finely ground oat hulls, selling at $20 a ton. Ninety per cent of the provenders (other than the output of the oatmeal mills) seem to be above reproach, while the remaining 10 per cent are hardly more than open to question. The wheat offals appear to be of excellent grade, no cases of adulteration being found, but, on the contrary, exceptionally high protein contents being observed."

Indian food grains and fodders—their chemical composition, J. W. Leather (*Agr. Ledger* (*1901*), *No. 10* (*Med. and Chem. ser., No. 14*), *pp. 349-376*).—Analyses are reported of *Andropogon halepensis*, *A. sorghum*, *Sorghum andropogon*, peanuts, oats, *Brassica campestris*, cocoanut cake, a number of legumes, millets, etc.

The composition of tendon mucoid, W. D. Cutter and W. J. Gies (*Amer. Jour. Physiol., 6* (*1901*), *No. 3, pp. 155-172*).—Among the conclusions drawn from a chemical study of tendon mucoid were the following:

"The average composition of mucoid separated from white fibrous connective tissue by the customary methods is very nearly the same as that of chondromucoid and osseomucoid. Thermochemical studies of the mucoids in tendon, cartilage, and bone emphasize the probability that these bodies are very intimately related."

The chemical constituents of tendinous tissue, L. Buerger and W. J. Gies (*Amer. Jour. Physiol., 6* (*1901*), *No. 4, pp. 219-231*).—The composition of tendinous tissue from a steer and a calf was studied.

The composition of yellow fibrous connective tissue, G. W. Vandegrift and W. J. Gies (*Amer. Jour. Physiol., 5* (*1901*), *No. 5, pp. 287-297*).—A chemical study of ligaments from a steer and a calf is reported.

The nutritive value of gelatin, O. Krummacher (*Ztschr. Biol., 42* (*1901*) *pp. 242-260, dgm. 1*).—On the basis of experimental data, including determinations of the heat of combustion and feeding tests with a dog, the author concludes that gelatin supplies the body with energy and hence prevents the cleavage of protein. When gelatin was fed in his experiments, the cleavage or protein was 62.6 per cent less than during fasting.

The effect of variations in the method employed for the artificial digestion of proteid materials, G. Berju (*Deut. Med. Ztg., 22 (1901), pp. 567, 568; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 6, p. 275*).—Experimental data are reported.

Some observations on the metabolism of protein, M. Gruber (*Ztschr. Biol., 42 (1901), pp. 407–427, dgms. 3*).—A number of the principles of metabolism are discussed at length in connection with the author's experiments. The author believes that fat is formed from protein and cites experiments in proof of this contention. The possibility of increasing the size of the organs of the body by any system of diet is also discussed, the author believing that this is only possible within the most narrow limits. The small gains or losses of nitrogen which are observed in metabolism experiments are discussed in detail and are believed by the author to depend upon a retention of protein or an increased metabolism of this nutrient, as the case may be. The protection of protein by different materials is also discussed.

Heat of combustion and physiological nutritive value of foods. I, Meat, J. Frentzel and M. Schreuer (*Arch. Anat. u. Physiol., Physiol. Abt., 1901, pp. 284–298; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 6, pp. 266*).—Experiments with a dog are reported which led to the conclusion that 74.84 per cent of the energy supplied in meat was rendered available by the body.

An experimental contribution to the question of the physiological protein minimum, M. Cremer and M. Henderson (*Ztschr. Biol., 42 (1901), pp. 612–618*).—Experiments with a dog are reported, in which the metabolism of nitrogen was studied.

Concerning the cause of increased proteid metabolism during fasting, F. N. Schulz (*Ztschr. Biol., 41 (1901), No. 3, pp. 368–377*).—A controversial article.

The influence of body fat in fasting animals, E. Voit (*Ztschr. Biol., 41 (1901), No. 4, pp. 502–549, dgms. 5*).—A number of experiments, some of which were made by the author, with different animals, are quoted and discussed in detail. According to the author, proteid cleavage in a fasting animal is markedly influenced by the fat content of the body. If a large amount of fat is present, the metabolism of protein is not increased at the beginning of the fasting period. However, as soon as the fat is diminished to a certain amount the cleavage of protein is relatively increased. Apparently the relation between the body fat content and the cleavage of protein is the same with different classes of animals, so that it is possible by means of the amount of proteid cleavage to estimate the amount of fat present. The effect of body fat upon the amount of proteid cleavage is dependent upon the relation between the amount of fat in circulation and the amount present in the fat reservoirs of the body. The relation between death due to fasting and the fat content of the body is also discussed.

Concerning the cause of the increased cleavage of protein during fasting, E. Voit (*Ztschr. Biol., 41 (1901), No. 4, pp. 550–571*).—A further discussion of the subject noted above. Respiratory quotient experiments are reported. These tests also indicate that the cleavage of protein is dependent upon the amount of fat present in the body.

The formation of fat from carbohydrates, K. B. Lehmann and E. Voit (*Ztschr. Biol., 42 (1901), pp. 619–671*).—A large number of experiments are reported which, the authors believe, show that fat may be formed from carbohydrates. In some of the experiments food, urine, and feces were taken into account; in others the respiratory products were also studied.

The utilization of rhamnose by the animal body and the related question of the physiological value of carbohydrates, M. Cremer (*Ztschr. Biol., 42 (1901), pp. 428–467*).—The work of earlier investigators is reviewed at some length and experiments made by the author with a dog and rabbits are reported. The conclusion was drawn that rhamnose diminishes the cleavage of fat in the body.

On the occurrence of oxy-phenyl-ethyl-amin in pancreas digestion, and on the cleavage of carbon dioxid by ferments, R. L. Emerson (*Beitr. Chem. Physiol. u. Pathol., 1 (1901), pp. 501–506; abs. in Chem. Centbl., 1902, I, No. 8, p. 485*).—Experimental data are reported and discussed.

Studies on the motor activity of the stomach, II, Moritz (*Ztschr. Biol., 42 (1901), pp. 565–611, fig. 1*).—A number of experiments are reported and discussed in detail.

The breeders' associations of the German Empire, January 1, 1901, O. Knispel (*Arb. Deut. Landw. Gesell., 1901, No. 66, pp. 257*).—Statistics and other data are given regarding the breeders' associations in the different States of the German Empire.

On the influence of awards of prizes for live stock on the development of Swedish animal industry, J. Ekelund (*K. Landt. Akad. Handl. Tidskr., 40 (1901), No. 4, pp. 217–269*).

Animal husbandry in Russia, R. Müller (*Fühling's Landw. Ztg., 50 (1901), No. 23, pp. 818–824; 51 (1902), Nos. 2, pp. 74–77; 3, pp. 108–114*).—A descriptive and statistical article.

Stock feeding, C. M. Conner (*South Carolina Sta. Bul. 67, pp. 13*).—The general principles of animal feeding are discussed, the composition of a number of feeding stuffs of the most importance locally is quoted, and rations composed of such materials suggested.

Waste products of western farms may become a source of profitable gain through the use of live stock, R. S. Shaw (*Montana Sta. Bul. 32, pp. 26–30*).—With a view of determining the value of grain, weeds, grass, etc., in stubble fields, 11 yearling steers, 8 heifers, 3 colts, 25 pigs, and 230 lambs were pastured for from 1 month to about 6 weeks on 112 acres which had been planted with wheat and other cereals, potatoes and other roots. During stormy weather the steers were fed some hay, the lambs some clover, and the pigs some barley meal. The original weight of the steers was 4,613 lbs., and the gain 447 lbs. The lambs at the start weighed 11,699 lbs., and gained 2,249 lbs. The pigs gained 877 lbs., the original weight being 2,731 lbs. Data for the other animals are not recorded. The author calculates that the "waste products" eaten by live stock yielded a "profit of $1.44 per acre over and above the value of the food secured by the animals and required for maintenance."

Beef production in Iowa, W. A. McHenry (*Iowa Agr., 1 (1902), No. 3, pp. 2–5*).—A general article.

Report on cod-liver oil as a substitute for cream in calf rearing, R. S. Seton (*Yorkshire Col., Leeds, and East and West Ridings Joint Agr. Council, Pamphlet 18 (1901), pp. 7, tables 2*).—Continuing previous work (E. S. R., 12, p. 668), 12 calves, about a month old, were fed whole milk for some 5 weeks. The ration of 8 of them was then gradually changed to skim milk and cod-liver oil, the amounts fed daily being finally 5 qts. of skim milk to 2 oz. of cod-liver oil. The remaining calves were continued on whole milk, 6 qts. per day being finally fed. After some 6 weeks all the calves were given meadow hay ad libitum and about 1 lb. per head daily of linseed cake and bran, the amount being gradually increased. The average weight of the calves at the beginning of the whole-milk period was a little over 112 lbs. each. The average daily gain of the calves fed whole milk in the 140 days of the test was 1.7 lbs. per head, that of the calves fed cod-liver oil 1.2 lbs. To test the value of continued oil feeding, the calves immediately after weaning were divided into 3 lots of 4 each. Lot 1, composed of the calves accustomed to it, was fed 2 oz. of oil daily with linseed cake and meal. The others were fed cake and meal only. In 28 weeks the average daily gain of the calves formerly fed whole milk was 2 lbs.; of those fed skim milk and oil and continued on an oil ration, 2.4 lbs.; and of those formerly fed oil, but not continued on it, 2.1 lbs. At the close of the test the calves were slaughtered. The following general conclusions were drawn: Cod-liver oil as a substitute for fat may be used with safety, supplementing separator skim milk for calves, and they readily become accustomed to it. Feeding cod-liver oil does not involve much labor, and with skim milk furnishes a cheap feed. Judging from the experiment reported above, it seems advisable to continue the oil feeding with linseed cake and meal for a time after weaning. The use of cod-liver oil in the early stages of calf feeding does not seem to have any bad effect on the flesh of the animals when slaughtered as bullocks.

Some notes on sheep husbandry, H. W. MUMFORD (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 163–165*).—The author quotes statistics covering several years which were kept of a flock of sheep. It was noted that on an average wether lambs gained in 60 days 2.25 per cent in live weight and 4.0 per cent dressed weight more than bucks of the same age. The feed consisted of early-cut clover hay. While with the ewes the latter were given 1 to 1.5 qts. shelled corn daily.

The goat in Germany, F. DETTWEILER (*Arb. Deut. Landw. Gesell., 1902, No. 69, pp. 207, figs. 11*).—Historical statements are made concerning the goat in Germany and the importance of the goat-raising industry. Goat raising in the different provinces of the German Empire is discussed and methods for further development of the industry suggested.

Pig-feeding experiments, J. R. CAMPBELL (*Yorkshire Col., Leeds, and East and West Ridings Joint Agr. Council, Garforth Expts., 1899, Pamphlet 8, pp. 4*).—The value of several grain rations mixed with different amounts of water was tested with 4 lots of 6 pigs each after a preliminary period of 124 days, during which the pigs had gained on an average 1.1 lbs. per head daily. The test proper covered 56 days. Lot 1 was fed barley meal, sharps, i. e., middlings, and gluten meal 2 : 1 : 1; lot 2 a mixture of equal parts of barley meal and maize meal; lots 3 and 4 barley meal and sharps 1 : 1. The grain ration of lots 1, 2, and 3 was mixed with four times and lot 4 with twice its weight of water. The average daily gain of the 4 lots was 1.1, 0.9, 1.1, and 1.4 lbs. per head, respectively, the food eaten per pound of gain being 5.3, 6.1, 5.7, and 4.9 lbs. According to the author, the effect of the rations was most marked with lots 3 and 4, the former receiving the ration in a sloppy condition, the latter in the form of a porridge. Larger gains were made on the drier ration and less food was required per pound of gain. The author believes that "the mixture of barley and meal and sharps is better than barley meal and maize, and that the latter mixture may be somewhat improved by the addition of a highly nitrogenous meal, and, finally, that a great deal of food may be wasted, particularly in winter, when pigs are fed upon food containing more water than is necessary for the requirements of the body. The cost of food supplied to lot 4 was about $4.56 greater during 8 weeks than that given lot 3, but the value of the increase of pork for the same lot was $10.20, thus leaving a balance of $5.64 in favor of the drier food."

Investigations on the metabolism of pigs fed sugar, starch, and molasses, E. MEISSL and W. BERSCH (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 8, pp. 805–921, pls. 2, figs. 6*).—Metabolism experiments with pigs are reported to compare sugar, starch, and molasses as the principal sources of carbohydrates in a ration. The basal ration in all the tests consisted of barley and dried brewers' grains. Food, urine, feces, and respiratory products were analyzed. For the collection of the respiratory products a Pettenkofer respiration apparatus was used. Experimental methods are discussed in detail, and the experiments reported in full. The following table shows the balance of income and outgo of carbon and nitrogen in the different periods, and the calculated gains of flesh (muscular tissue) and fat.

Summary of metabolism experiments with pigs.

[Quantities per day.]

Principal feeding stuff.	Carbon.					Nitrogen.				Muscular tissue gained.	Fat gained.
	In food.	In feces.	In urine.	In respiratory products.	Gain.	In food.	In feces.	In urine.	Gain.		
	Grams.	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*
Sugar	555.57	185.18	11.02	288.40	70.97	23.70	9.84	8.82	5.04	155.0	70.9
Barley	552.62	158.77	6.23	294.09	93.53	23.84	9.62	8.34	5.88	180.8	96.7
Starch	549.55	179.29	6.83	279.55	83.88	23.72	9.39	8.07	6.26	192.5	82.5
Molasses	638.09	199.58	27.49	343.29	67.73	33.97	12.14	13.52	8.31	255.6	52.5
Do	565.08	179.31	23.44	286.57	75.76	33.09	11.14	11.00	10.95	336.8	51.6
Potatoes	906.05	229.00	14.01	425.55	237.49	38.74	10.72	19.10	8.92	274.4	271.7
Barley	899.22	237.18	11.19	425.74	225.11	39.24	12.62	19.19	7.43	228.5	262.0
Molasses	957.74	277.69	14.02	447.69	218.34	47.86	18.14	26.33	3.39	104.2	270.7
Do	560.97	170.24	27.67	259.31	103.75	33.00	12.10	16.06	4.84	148.80	114.7
Barley	530.96	134.40	10.19	300.38	85.99	23.03	8.91	11.44	2.68	82.45	100.8
Molasses	559.98	168.40	32.89	301.27	57.42	32.90	12.56	17.20	3.14	96.61	61.5
Do	948.11	253.01	34.91	471.19	189.00	51.98	16.53	24.60	10.85	333.70	200.1
Potatoes	871.06	209.66	13.68	516.24	131.48	39.08	13.02	14.54	11.52	354.40	121.9
Molasses	952.80	237.02	44.11	520.61	151.06	51.17	15.45	24.28	11.44	351.80	148.0

A number of general deductions were drawn from the experiments, some of which follow. In all the experiments in which a normal ration was fed—i. e., one in which the starch was furnished by barley or potatoes—the protein was very well digested. In periods in which molasses was fed the digestibility of proteids was diminished and that of non-nitrogenous nutrients increased. Generally speaking, the coefficients of digestibility of fats were low. As noted by other observers, the amount of carbon dioxid excreted was proportional to body weight. Less was excreted in the molasses period than in other periods. On the whole the authors regard molasses as a somewhat better feeding stuff than starch in the form of barley. Better results were also obtained with molasses than with sugar. From these experiments sugar does not appear to possess a higher nutritive value than other carbohydrates. The authors note that it can be regarded also as a stimulant. An examination of the fat of the pigs showed that molasses did not exercise an unfavorable effect on its composition.

Tankage as a food for swine, C. S. Plumb (*Proc. Soc. Prom. Agr. Sci., 1901, pp. 95–98*).—Noted from another publication (E. S. R., 13, p. 1079).

Experimental contributions to the theory of heredity, J. C. Ewart (*Trans. Highland and Agr. Soc., Scotland, 5. ser., 14 (1902), pp. 172–229, figs. 26*).—The author discusses in a critical manner a number of the cases usually mentioned as supporting the hypothesis of telegony in horses. In all cases other simpler explanations are found for the actual phenomena which were observed without resorting to any theory of "infection," "corruption," or influence of a previous sire. The experiments conducted by the author were chiefly confined to the production of crosses between horses and zebras, and the raising of colts from the same mares after production of the hybrids. In these experiments chestnut, brown, and black mares were employed, and in some cases the mare was bred alternately to zebra and horse stallions, in order to give the best possible opportunity for judging any influence of the zebra upon the appearance or conformation of the offspring. No evidence whatever was obtained in support of the theory of telegony. The colts obtained in mares which had previously been bred to zebras were true to their parents in every respect and exhibited no mental or physical traits of the zebra. A brief review is given of the results of the experiments of Baron de Parana, in Brazil. His experiments were based on extensive raising of mules, and the observations of de Parana and his acquaintances engaged in the same occupation are distinctly opposed to the theory of the influences of the previous sire.

The author also conducted experiments for the purpose of determining whether any support of the hypothesis of telegony could be obtained from breeding mares to different breeds of stallions. These results were also unfavorable to the theory of telegony, as were similar experiments in breeding mares to various stallions of the same breed. The author states that although at the beginning of his experiments he "hoped to prove the fact of telegony," his experiments and observations have thoroughly convinced him that there never has been an undoubted case of "infection" in dogs, rabbits, or horses.

Poultry experiments, J. H. Shepperd (*North Dakota Sta. Rpt. 1901, pp. 89–91*).—A comparison was made of the egg production of 19 hens 1 year old and 12 hens 2 years old. The average number of eggs laid by the hens 1 year old in 180 days was 49.4 and of the hens 2 years old 15.7. The number of eggs laid by individual hens is reported in connection with a brief discussion of breeding for egg production.

Subdepartment of poultry, H. C. Gardner (*Montana Sta. Bul. 32, pp. 50–52*).—Brief notes are given regarding the station poultry equipment and management of poultry. Two feeding tests are noted, no details being reported.

Incubators and brooders and their management, D. S. Thompson (*Agr. Gaz. New South Wales, 13 (1902), No. 1, pp. 15–21*).—Incubators are described and tests of a number of sorts at the Hawkesbury Agricultural College are reported.

On the determination of the soundness of eggs by their specific gravity, C. Coggi (*Gior. R. Soc. Ital. Ig., 1901, Apr. 30; abs. in Public Health, 14 (1902), No. 7, p. 423*).—From experiments reported in detail, the author concludes that the specific-gravity method of testing the freshness of eggs with a salt solution does not give reliable results.

DAIRY FARMING—DAIRYING.

The immediate effect on milk production of changes in the ration, W. P. Wheeler (*New York State Sta. Bul. 210, pp. 373–433*).—Records of 981 cows for limited periods, obtained for the most part in extensive tests of breeds covering a number of years, are grouped to show the immediate effect upon milk production of changes in the ration as regards total digestible organic matter, fuel value, amount of protein, and nutritive ratio. The record in each case is taken for the 2 to 4 weeks preceding and following a change in the ration. No ration was fed that was radically deficient in any respect, and the change was never very marked. Averages of the 111 groups based upon the character of the ration fed are presented in tabular form and discussed. The author's summary of the results in part is as follows:

"*Total nutrients.*—In general, the milk flow increased most or diminished least when the greatest increase of total nutrients was made without regard to moderate changes in protein content. The most rapid shrinkage of milk flow generally occurred when the percentage reduction of total nutrients was greatest, although this usually was associated with a reduction of protein.

"On the average for all records when an increase of the total nutrients was made, there was no change in milk production. On the average for all when the amount of nutrients was reduced, the shrinkage in milk flow was at twice the normal rate. . . .

"*Fuel value.*—An average of all records when an increase in the fuel value of the ration was made shows a diminution in milk yield about one-fifth as great as would usually occur under unchanged rations. An average of all records when the fuel value was reduced shows about twice the usual diminution in milk yield. . . .

"*Protein.*—In general, changes in the amount of protein within ordinary limits produced less effect than changes in the amount of total nutrients. On the whole, the diminution of milk flow was less when the amount of protein was increased than when it was reduced.

"On the average for all records when the protein was increased, those including also an increase of total nutrients show no falling off in milk production, those with but little change in nutrients show a normal diminution or less, those with a reduction of nutrients show a shrinkage greater than usual. On the average for all records when the protein was reduced those with an increase of total nutrients show less than the usual decrease in milk production, those with but little change of nutrients show about the normal shrinkage, those with a reduction of nutrients show a falling off at twice the normal rate.

"The average of those records where there was an increase of protein without change in amount of total nutrients shows an increased cost of production. There was no increase in the cost of production, on the average, when the protein was reduced without change in amount of nutrients. . . .

"*Nutritive ratio.*—Changes in the nutritive ratio within the ordinary limits had considerably less influence on the milk flow than did changes in the amount of total nutrients. In general, however, a narrowing of the ratio had a favorable effect on milk production, while a widening of the ratio tended toward the reverse.

"When but little change in the amount of total nutrients occurred, a narrowing of the ratio was followed by less than the usual decrease in milk yield and a widening of the ratio by more than the usual decrease.

"With an increase in the amount of total nutrients, a narrowing of the ratio was followed by an increase in milk yield. A widening of the ratio was followed by a decrease (to less than the usual extent), although the average increase of total nutrients was nearly a pound greater than when the ratio was narrowed."

How changes in feed affect the yield of milk, F. H. HALL and W. P. WHEELER (*New York State Sta. Bul. 210, popular ed., pp. 8*).—A popular summary of the above bulletin.

Feeding trials with cows, J. L. HILLS (*Vermont Sta. Rpt. 1901, pp. 314–369, I–XLV*).—In continuation of similar work (E. S. R., 13, p. 584) carried on at the station for 4 years, numerous feeding experiments, including 51 cows and lasting 28 weeks, are reported in detail and summarized. A full account is given of the manner in which the experiments were conducted and tabulated data are presented in an appendix.

A comparison of 4, 8, and 12 lbs. of grain was made with 16 cows with results essentially the same as those obtained last year. An increase in the grain ration increased the yield of milk and butter, but not in proportion to the amount of grain fed. The slight variations observed in the quality of the milk were in favor of the medium grain ration. More milk and butter per pound of dry matter was produced on the low grain ration. From a financial standpoint the results were unfavorable to the high grain ration. "It is felt on the whole that neither the low or the high ration ranks with a medium grain ration for practical continuous dairy feeding."

The effect of adding protein and fat to standard rations was studied with 14 cows with results essentially the same as those previously reported. An excessive amount of protein did not materially increase the yield of milk, and its quality was not improved. The addition of palm oil to the ration seemed to give a permanent increase in the fat content of the milk.

The feeding value of germ-oil meal, a by-product of the glucose industry, was compared with that of mixtures of (1) cotton-seed meal, new process linseed meal, and wheat bran, and (2) wheat bran and ground oats. The germ-oil meal ration increased the yield of milk and butter 3 and 6 per cent, respectively, over the other 2 rations.

A hay and grain ration was fed with and without silage in alternating periods to 6 cows. When one-third of the hay was replaced by silage the yield of milk and butter was increased 7 per cent. The silage ration was much more profitable.

Results for 2 winters show no improvement in the quantity or quality of the milk yield from warming water from 35 to 80° F. for cows stabled in barns the average winter temperature of which was 45 to 50° F.

Tests were made of the feeding value of apples, apple pomace, and pumpkins. A substitution of apples for three-fourths of the corn silage in a ration containing in addition hay and grain lessened the yield of milk and butter 8 per cent. A similar substitution of apple pomace for silage decreased the yield of milk and butter 2 per cent. Pumpkins were substituted for silage, the results showing a decrease of 1 to 2 per cent in the yield of milk and butter. No unfavorable effects followed feeding apple pomace or pumpkins. These experiments indicate that 1 ton of corn silage has the same feeding value as 2½ tons of apples, 1¼ tons of apple pomace, and 2½ tons of pumpkins.

Additional data are given concerning the experimental error involved in feeding trials. "The results of continuous feeding on a regular ration were practically uniform. If more than 2 or 3 animals are used, the experimental error inherent in the alternation method of feeding trials may be nearly or quite disregarded."

A comparison of feeding trial methods, J. L. Hills (*Vermont Sta. Rpt. 1901, pp. 369–375*).—In the feeding experiments with low, medium, and high grain rations noted above a comparison was also made of methods of conducting feeding experiments. Different rations were fed in alternate periods to the same group of animals and continuously to different groups. The data are tabulated and discussed in detail. "So far as these trials go, they seem to affirm within limits the validity of both schemes of experimentation, provided periods 4 or 5 weeks long be used and the choice of animals be satisfactory."

The effect of feed on the quality of butter, J. L. Hills (*Vermont Sta. Rpt. 1901, pp. 375–377*).—In connection with the feeding experiments noted above and in continuation of previous work (E. S. R., 13, p. 585) studies were made of the effect of different feeding stuffs upon the quality of butter. Feeding an excessive amount of protein did not materially affect the quality of the butter fat. Feeding palm oil in addition to a standard ration increased the melting point of the butter fat 4° C. and decreased the content of volatile fatty acids. Germ-oil meal increased the iodin number. An increase in the hardness of the butter fat lengthened the time required for churning, but decreased the loss of fat in the buttermilk. The quality of the butter was not materially affected by the different feeding stuffs.

Feeding experiments with gluten meal and gluten feed for dairy cows, H. Goldschmidt (*Ugeskr. Landm., 47 (1902), No. 9, pp. 104–111*).—Cooperative feeding experiments with milch cows for the purpose of comparing gluten meal and gluten feed with ordinary concentrated feeds are reported. According to the plan of the experiments, 3 lbs. of gluten meal or feed replaced an equal weight of the kind of grain mixtures ordinarily fed on the 14 dairy farms on which the experiments were conducted, the mixtures being made up of varying quantities of barley and oats, rape-seed cakes, sunflower-seed cakes, cotton-seed cakes, molasses bran, etc. Nine of the experiments were with gluten meal and 5 with gluten feed. The amount of grain fed ranged from 4½ to 10 lbs. per head daily. The experiments were divided into a preliminary feeding period, two experimental periods, and a post-experimental period, of 2 to 3 weeks each. The number of cows included in the experiments at the different farms varied from 6 to 40, the cows being in all cases separated into two lots, as nearly uniform as possible as regards production, time of calving, age, etc. Analyses of the milk produced do not appear to have been made, but the average daily milk yield per cow during the gluten meal feeding over and above that produced on ordinary grain mixtures amounted to 0.8 to 2.5 lbs., or, on the average, 1.45 lbs. avoirdupois, and on the gluten feed, 0.2 to 2.1 lbs., or, on the average, 0.85 lb. avoirdupois. At the prevailing prices of concentrated feeding stuffs in Denmark the results indicate that a saving of at least $30 per carload of feed may be effected by feeding 3 lbs. of gluten meal per head daily in the place of an equal quantity of common feed mixtures. No deleterious effects on the health or live weights of the cows were noticed during the experiments. Four pounds of gluten meal is considered a maximum allowance per day for dairy cows. It is suggested that both gluten meal and feed may also prove valuable foods in feeding horses, in amounts not to exceed 3 to 4 lbs. per head daily.—F. W. WOLL.

On feeding of dairy cattle, L. DYHRE (*Ugeskr. Landm., 47 (1902), No. 11, pp. 128–132*).

Feeding corn stover; dehorning milch cows, C. M. CONNER (*South Carolina Sta. Bul. 66, pp. 9*).—The yields of corn stover (whole stalks after removal of the ears) and corn fodder (blades only) on several plats at the station are given and the composition of corn stover is discussed. Shredded corn stover and cotton-seed hulls fed ad libitum with a uniform grain ration were compared with 2 lots of 4 cows each in an experiment lasting 31 days. Detailed data for the experiment are given. On the corn stover ration milk was produced at a cost of 6.84 cts. per gallon and on the cotton-seed hull ration at a cost of 7.14 cts. per gallon. "Definite conclusions can not be drawn from this experiment, on account of the limited time during which it was carried on, but it shows that the corn stover has a greater feeding value than cotton-seed hulls."

The total decrease in the yield of milk of 7 cows for the 5 days following dehorning as compared with the 5 days preceding was 16.1 per cent. Three of the cows were not much affected by dehorning.

Jersey cattle in Jutland, J. LARSEN (*Ugeskr. Landm., 47 (1902), No. 2, pp. 17–19*).—In comparing the production of Jutland and Jersey cows in a Danish herd, the latter proved superior to the domestic breed as regards the quality of the milk and the amount of butter fat produced. The Jersey cows produced at the rate of over 2 lbs. more butter per 100 lbs. of food units eaten than the Jutland cows.—F. W. WOLL.

The variation in the composition of cows' milk, H. INGLE (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 14 (1902), pp. 284–313, dgms. 13*).—The investigations with cows on dry feed reported last year (E. S. R., 13, p. 279) were repeated with cows on pasture. During 2 periods of 20 days each in August and September over 1,600 samples of milk from 19 cows were collected and analyzed. The results are presented by means of diagrams, and are discussed in connection with the data previously reported as regards the effect of period of lactation, season of the year, time and manner of milking, and food upon the composition of the milk. The quality of the milk is shown to decrease for the first 2 or 3 months of the lactation period and then to increase steadily as lactation advances. The average fat content of some 700 samples of milk obtained in March and April, 1900, was 3.86 per cent. In the present investigations samples analyzed during the first period (August 1 to August 20) showed 3.40 per cent of fat, and samples analyzed during the second period (August 20 to September 9) showed 3.46 per cent of fat—showing a lower fat content in the fall. As in the earlier investigations the cows were milked at 6 a. m. and 3 p. m. During the first period the average fat content of the morning's milk was 2.72 per cent and the evening's milk 4.09 per cent. During the second period the percentages were 2.83 and 4.09, respectively. Analyses of the mixed morning's milk showed also that the fat content may often fall below 3 per cent in the late summer or autumn where the intervals between milkings are unequal. The cows were divided into 4 lots which were fed uniformly during the first period a grain ration of 2 lbs. of decorticated cotton-seed cake. During the second period lot 1 was fed the same ration, lot 2, 4 lbs. of Chicago gluten meal, lot 3, 6 lbs. of corn meal, and lot 4, 28 lbs. of fresh brewers' grains. The yield of milk of the 4 lots during the second period, as compared with the first, decreased, respectively, 9.44, 5.69, 6.49, and 12 per cent. The fat content increased in the case of lots 1, 2, and 4 and decreased in the case of lot 3. The results on the whole are considered as indicating that foods rich in proteids increase the yield and quality of the milk, while large quantities of carbohydrates, though slightly increasing the yield of milk, tend to diminish its quality.

Variations in cream and milk tests, A. H. Wheaton (*South Dakota Sta. Bul. 73, pp. 19, pls. 5*).—The causes of variations in the composition of milk are briefly discussed, and tables are given showing the temperature, specific gravity as determined by the Quevenne lactometer, and the fat content as determined by the Babcock test, of a large number of samples of milk as received at several creameries in the State. The author also discusses the so-called dilution separators, concluding that there is no advantage gained in their use over ordinary cans, and quoting from New York Cornell Bulletin 151 (E. S. R., 10, p. 591) in support of this view. In testing cream by the Babcock method the author recommends weighing the sample of cream. End and side views and plans of a creamery are given, and it is announced that specifications, incorporation papers, etc., will be furnished free on application to those desiring to build creameries, provided that they will safely preserve and return the same.

Killing tubercle bacilli in milk heated to a temperature of 60° C., W. Hesse (*Ztschr. Thiermed., 5 (1901), No. 5–6, pp. 321–325*).—Theobald Smith, in experiments in the pasteurization of milk, demonstrated that the tubercle bacillus was killed by heating milk to a temperature of 60° C. for a period of from 15 to 20 minutes. The author tested these conclusions on a large scale, and a large firm of milk dealers was prevailed upon to try the experiment of heating their milk to 60° C. for 20 minutes. The milk was heated in large vessels to a temperature of 60° C., and was kept at this temperature for exactly 20 minutes, after which it was cooled as quickly as possible to a temperature of 8° C. During the time while the milk was being pasteurized it was stirred continually so as to prevent the formation of a pellicle on the surface, or the cooling of the superficial layer of milk. The author inclosed cultures of tubercle bacilli in glass tubes hermetically sealed and placed these tubes in 3 vats of milk heated at temperatures of 60, 58, and 57° C., respectively. Inoculation experiments made on guinea pigs with the material contained in these vessels showed that all tubercle bacilli which were heated to a temperature of 60° C. were destroyed, while the guinea pigs which received the other cultures heated to a temperature of 58 and 57° C., respectively, developed cases of tuberculosis of a more or less generalized nature. It is believed that the sterilization of milk is best secured with the least changes in the composition and taste of the milk by a subjection to a temperature of 60° C. for 20 minutes. Observations showed that by this treatment other organisms, including those of cholera, typhus, and diphtheria, were also killed.

On the composition of Dutch butter, J. J. L. van Rijn (*London: Baillière, Tindall & Cox, 1902, pp. 48 + 7*).—On account of the frequent charge of adulteration made against Dutch butter by foreign analysts during each fall, the Netherlands Government caused an investigation to be made of the composition of butter made during the latter months of the year. The results of analyses of 428 samples of Dutch butter obtained from various sources and known to be genuine are presented in this report. The methods of analysis employed were those used in the government laboratory in England. Of the 428 samples, 214, or 50 per cent, showed a volatile fatty acid number less than 25, the lowest limit accepted for pure butter in England, while 6 samples showed a number lower than 20. The averages by months were, September, 24.8; October, 23.7; November, 25.2; December, 26.6. When the cows were stabled in the fall and their food improved, the volatile fatty acid number increased. The abnormal composition of butter in the autumn is therefore attributed to poor food and exposure to inclement weather due to the custom of late pasturing. Conditions affecting the composition of milk and butter are discussed, and a discussion of the new Belgian butter law is appended.

Chemical and physical characteristics of fat of Norwegian creamery butter, F. H. Werenskiold, S. Hals, and H. Gregg (*Aarsbr. Offent. Foranst. Landbr. Fremme, 1901, pp. 30*).—The investigations here reported were conducted during the years 1898–1901, to establish the variations that are apt to occur in the chemical and physical properties of butter fat from pure Norwegian creamery butter. In all 682 samples of butter from 21 creameries located in different parts of Norway were examined. The following table presents the average data obtained for each month, with maxima and minima for the different determinations:

Average results of examinations of Norwegian creamery butter.

Month.	Specific gravity (at 37.8° C.).	Refractive index (at 45° C.).	Reichert number.	Iodin number.
January	0.9120	39.80	31.00	33.0
February	.9122	39.85	31.00	32.1
March	.9123	39.90	30.80	32.7
April	.9120	40.05	30.95	33.4
May	.9116	40.50	29.95	35.3
June	.9110	41.40	28.55	39.3
July	.9104	41.95	28.45	39.6
August	.9107	41.80	28.60	39.3
September	.9110	41.40	29.75	38.7
October	.9114	40.35	30.15	34.9
November	.9123	39.50	30.70	30.6
December	.9123	39.55	30.90	31.0
Minimum	0.9082 (Sept.)	38.70 (Oct.) (Dec.)	21.10 (June)	28.2 (Nov.)
Maximum	.9130 (Dec.)	43.70 (June)	34.90 (Jan.)	45.1 (June)

The results show that the butter fat from the creameries investigated may assume such a composition during the spring months that according to the methods of analysis adopted it would have the same effect as an admixture of artificial butter fat; it may retain this changed character during the summer and not return to normal values again until in the fall. The results of van Rijn, Böggild, and Stein as to the increase in Reichert number at the tying in in the fall were corroborated.—F. W. WOLL.

Report of Danish butter exhibits during 1901, F. Friis (*Copenhagen, 1902, pp. 39*).—During the calendar year 1901, 808 different creameries exhibited butter amounting in all to 2,376 tubs. The average water content of the butter exhibited was 14.06 per cent.

A report is given of investigations conducted during 5 consecutive years (1897–1901) concerning the refractive index and volatile fatty acids of Danish creamery butter. The figures given in the following table, which have been compiled from tables in the report, represent average data for the 5 years. The total number of samples of butter fat examined during this period was 10,475.

Average results of examinations of butter fat, 1897–1901.

Month.	Refractive index (at 25° C.).	Reichert number.	Month.	Refractive index (at 25° C.).	Reichert number.
January	50.6	30.57	August	52.4	28.2
February	50.7	30.60	September	52.8	27.5
March	50.9	30.47	October	52.4	28.1
April	51.0	30.27	November	50.6	30.4
May	51.3	29.6	December	50.4	30.7
June	51.3	30.4			
July	51.8	29.4	Average for year	51.4	29.7

The monthly variations in the refractive indexes or volatile fatty acids are repeated very regularly from year to year, and the average data for the different months given in the table may, therefore, be considered normal figures for Danish butter at the present time. A high refractive index is in general accompanied by a low Reichert number, but this does not always hold true in single instances.

In connection with this question, information was sought as to the relation between the quality of the butter and the content of volatile fatty acids, it having been contended by some food chemists that even if a low content of volatile fatty acids is not necessarily evidence of adulteration, it shows an inferior quality and food value of the butter and this should, therefore, in some manner be subject to penalty. The data brought together in this and earlier reports of the Copenhagen experiment station (E. S. R., 12, p. 681) show that the variations found in the content of volatile fatty acids of Danish butter have nothing to do with the purity of the butter, its nutritive value, flavor, or in general, with anything that concerns the quality of the butter. In order to obtain conclusive evidence on this point, all the samples of butter received after April, 1901, scoring lowest and highest, were examined for refractive index and for volatile fatty acids, and the results are tabulated in the report. The scores of butter having the lowest and the highest refractive indexes and Reichert numbers are also given. The following summary table presents the average data thus compiled. According to the plan of judging butter adopted in the Danish butter exhibits, 15 is a perfect score.

Relation of quality of butter, refractive index, and volatile acids of butter fat.

	Cooperative creameries.			Private dairies.			All samples.	
	Score.	Reichert number.	Refractive index.	Score.	Reichert number.	Refractive index.	Score.	Reichert number.
Highest scores	12.3	29.3	51.7	10.5	28.4	51.9	11.5	28.9
Lowest scores	5.4	28.9	51.7	6.3	28.6	51.8	5.9	28.8
Highest Reichert number	9.4	30.4	50.6	8.3	29.7	51.3	8.9	30.1
Lowest Reichert number	9.5	27.3	52.8	8.5	27.3	52.6	9.2	27.3

The best butter contained more volatile fatty acids than the butter of the poorest grade in 15 cases out of 35, while the opposite was true in 18 cases, the volatile acid content being the same in 2 cases. While the figures in the last two lines of the table might be interpreted to show that a high content of volatile acids was found in case of lower scoring butter, the difference is most likely accidental, since the results for the single exhibits come sometimes one way and sometimes another. The author therefore concludes that there is no correlation between the quality of the butter and the volatile-acid content of the butter fat.—F. W. WOLL.

Denmark's butter exports, 1900-1901, B. Böggild (*Tidsskr. Landökon., 1901, No. 11, pp. 515-524*).—The net exports during the year 1900-1901 were 118,888,375 Danish pounds, an increase of nearly 10,000,000 lbs. over those of the preceding year, and the gross exports 165,531,812 lbs. Of this quantity nearly 158,000,000 lbs. was exported to Great Britain. The average price of the butter for the year was 98 öre per pound (23.9 cts. per pound avoirdupois), about one-sixth of a cent above the average price for 1899-1900.—F. W. WOLL.

Testing Babcock milk and cream bottles, C. H. Jones (*Vermont Sta. Rpt. 1901, pp. 222, 223*).—The method employed at the station in testing bottles is described. Having determined that the total capacity of the neck is correct by the use of 1 cc. of mercury for each 5 per cent on the scale the author determines if there are any material irregularities in the bore by means of an instrument devised by him which "consists of two brass arms sufficiently long to reach to the zero mark on the bottle scale. These are pivoted near their center and play easily back and forth. The upper end of one is securely attached to a circular brass dial, and the end of the other is so connected with a pointer, or hand, on the dial that the slightest movement of the lower end of the brass arm causes a greatly increased revolution of the hand on the dial face. A spring on the back of the dial keeps a steady tension at the ends of the brass arms, enabling them when inserted in and drawn up the sides of the glass bottle neck to adjust themselves instantly to any variations that may occur and to manifest the same by a movement of the pointer." Bottles showing decided irregularities are further tested by filling to the zero mark with mercury and adding 0.5 cc. portions from a specially devised burette.

VETERINARY SCIENCE AND PRACTICE.

Therapeutic observations (*Ztschr. Veterinärk., 13 (1901), No. 5, pp. 213-234*).—Experiments were tried with injections of carbolized water in the treatment of tetanus. Of 8 cases treated in this manner, 4 recovered and the other 4 died. Carbolized water in a 2 to 3 per cent solution was injected subcutaneously, twice per hour, in doses of 5 to 10 gm. In the treatment of tetanus with antitoxin, 9 out of 15 horses which received the antitoxin died, while 6 recovered. In some cases another form of treatment was adopted during which, in addition to the antitoxin, a serum was injected which had been obtained from a horse previously infected with tetanus. According to experiments of Kammerhof the administration of antitoxin in some cases brings about a rapidly fatal course of the disease.

Several experiments are reported in the treatment of parturient paresis with iodid of potash. Unfavorable results were obtained in only 3 cases. The remedy was applied in the way of infusions into the udder.

The same substance was also tested in the treatment of metritis, with results which left it doubtful whether recovery was entirely due to the administration of iodid of potash.

Experiments were tried with creolin in the treatment of anthrax in cattle. Creolin was given by way of the mouth and also in clysters in water. The treatment gave good results.

Detailed notes are given on the results obtained by a number of army veterinarians with colloidal silver in the treatment of morbus maculosus in horses, catarrhal fever in cattle, septic processes, phlegmonous infection, and in the treatment of wounds.

Therapeutic observations (*Ztschr. Veterinärk., 13 (1901), No. 6, pp. 272-291*).—Reports are made on experiments with two silver preparations—citrate of silver, also known as itrol, and silver lactate, known in trade as actol. These antiseptic substances in experiments thus far made have proved to be as effective as the colloidal silver preparation of Credé. Notes are also given on a large number of antiseptic preparations which have been used in the treatment of wounds and septic processes.

The culture of anaerobic bacteria, H. HAMMERL (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), No. 17, pp. 658-664*).—The chief difficulty experienced in the culture of anaerobic bacteria is the production of strictly anaerobic conditions. Nearly all of the various devices which have been employed in such experiments have been defective to the extent that during some part of the experiment oxygen was allowed to enter into the atmosphere surrounding the bacteria, or into the nutrient medium. In order to prevent the access of oxygen the author recommends that an ammonium sulphid medium be placed in a glass vessel and that the neck of the vessel be closed with a loose sterilized plug of cotton from which all fat has been removed. The lower half of the cotton plug should be saturated with solution of pyrogallic acid. The upper portion of the plug should be protected with a rubber cork. Care must be exercised that the pyrogallol should not come in contact with the nutrient medium, and the cotton must be absolutely free from fat.

The dissemination of infectious diseases by insects, C. F. DAWSON (*Amer. Vet. Rev., 25 (1901), No. 4, pp. 266-272*).—A brief review of the literature on this subject. Among the insects which are mentioned as possible carriers of disease are bedbugs, house flies, tsetse flies, mosquitoes, and cattle ticks.

Parasitically inoculated diseases, E. G. Wheler (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 14 (1902), pp. 16–35, figs. 2*).—The author briefly reviews his work on the life history of the grass tick (*Ixodes ricinus*), already noted (E. S. R., 11, pp. 891, 892). In this article especial attention is given to a comparison between louping ill and a number of other similar diseases, including Texas fever, malaria, tsetse-fly disease, surra, heartwater, and yellow fever. The author believes that louping ill is in some unexplained manner transmitted from one animal to another by means of the grass tick. It is argued that the striking similarity in the occurrence and symptoms of louping ill and other diseases which are known to be transmitted through the agency of insects substantiates this assumption.

Verminous bronchitis in calves (*Farmers' Gaz., 60 (1901), No. 42, p. 763*).—The symptoms of this disease are briefly described. The disease is due to the presence of *Strongylus filaria* in the bronchial tubes. In ordinary cases of the disease turpentine in spoonful doses may be administered daily in a few ounces of linseed oil. Where a considerable number of animals are infected at once they may be inclosed in a tight apartment and fumigated with sulphur. The use of chlorin gas for the same purpose is recommended as very effective, but rather more irritating and dangerous than sulphur.

The migration of the embryos of tapeworms, Hofmann (*Berlin. Thierärztl. Wchnschr., 1901, No. 36, pp. 537–541, figs. 7*).—From extended observations on this subject it is concluded that the oncosphere stage of tapeworms may leave the alimentary tract by means of the lymphatic vessels and efferent veins; through the veins they may reach the liver, and by means of the lymph fluid they may obtain entrance into the general circulation. They may pass through the capillaries, after remaining in that situation for some time.

The toxin of tapeworms, Massineo and Calamida (*Jour. Méd. Vét. et Zootech., 5. ser., 5 (1901), Sept., pp. 537–541; trans. from Gior. R. Soc. Accad. Vet. Ital., 1901, No. 30*).—The authors investigated the causes of the pathological changes produced by the presence of tapeworms in the intestines of various animals. The tapeworms were crushed in a mortar and an extract was obtained without heating and was later passed through a Berkefeld filter. The species used in these experiments were *Tænia saginata*, *T. expansa bovis*, *T. alba*, *T. cucumerina*, and *T. cænurus*. The filtrate obtained by treatment just described was used for inoculating guinea pigs, rabbits, and dogs. In the first series of experiments filtrate was inoculated hypodermically in doses varying from 2 to 35 cc., according to the weight of the animals. Symptoms of intoxication were produced in all cases, and 2 guinea pigs died after 24 hours. In further experiments similar results were obtained. The authors believe that the pathological changes produced in the intestines of the hosts of tapeworms are due to a secretion of toxin rather than to mechanical friction.

Sturdy or gid, F. V. Theobald (*Agr. Gaz.* [*London*], *54 (1901), No. 1455, p 335, figs. 2*).—A description is given of the parasite which causes this disease, and the usual symptoms of the disease are mentioned. The life history and development of the parasite are described. In the prevention of this disease the author recommends that the heads of infested sheep should be destroyed in order to prevent their being eaten by dogs. Dogs which are allowed to run on sheep pastures should be treated frequently for tapeworms in order to prevent transmission of this parasite to the sheep.

Treatment of sheep scab with acaprin, H. Raebiger (*Monatsh. Prakt. Thierh., 13 (1901), No. 5, pp. 231–236*).—Experiments were carried out for the purpose of testing the efficiency of this substance in destroying the scab mite. In all 550 sheep suffering from Dermatocoptes infestation were treated with acaprin. In May 100 ewes and 100 lambs, all shorn, were dipped in a solution of acaprin. The wool was not injured, but the dipping had no effect on the scab mites. It was also noted that the workmen were badly affected by the solution and complained of headache. Further experiments with this substance showed that by prolonging the bath and thoroughly rubbing the sheep with brushes the mites may be destroyed, but the effect of acaprin on the workmen is severe, producing serious illness in many cases. In some cases the inhalation of the fumes of acaprin caused great irritation of the throat and a cough which persisted for several weeks. Similar symptoms were observed in some of the sheep which accidentally swallowed some of the solution while passing through the dipping vat. The high price of acaprin and its deleterious effects upon the workmen who attend to the dipping are considered as rendering the substance unfit for general use.

Prophylaxis of dourine and an account of recent discoveries concerning this disease, T. BUFFARD and G. SCHNEIDER (*Jour. Méd. Vét. et Zootech., 5. ser., 5 (1901), July, pp. 385–397, fig. 1*).—Since the trypanosoma which causes this disease has been discovered it has become possible to make a diagnosis more quickly and to institute better measures for controlling the spread of the disease. The authors report a number of experiments during which animals were infected with the disease. It was found that at times the disease may develop without the appearance of the symptoms by which it is usually recognized. In preventing the spread of dourine the authors recommend a microscopic examination of the blood or pathological products from suspected stallions in order to make a certain and rapid diagnosis. As a further test, the blood or pathological products may be used for inoculating dogs, which are considered the most suitable animals for use in experiments in determining the nature of this disease. As soon as cases are determined, it is necessary to exclude the affected animal from breeding service.

An attempt at a classification of endoglobular hematozoa, LAVERAN (*Compt. Rend. Soc. Biol. Paris, 53 (1901), No. 27, pp. 798–801*).—The author recognizes 3 genera in this group of protozoa and characterizes them under the names Hæmamœba, Piroplasma, and Hæmogregarina. A table is given showing the species which are referred to each of these genera, and the hosts in which they are found.

Mange in cattle and horses and lice on hogs, A. T. PETERS (*Nebraska Sta. Bul. 74, pp. 27, figs. 16*).—Brief historical notes are given on the origin and distribution of cattle mange in this country. It was first reported to the author from Nebraska in 1896. The disease is apparently more serious in late fall and winter than in summer, and develops the most pronounced symptoms in yearlings. The mite which causes this disease is described and notes are given on its life history.

If only a few mangy cattle are to be treated a liquid remedy may be applied by a swab, brush, or spray pump. Where large numbers of cattle are affected, however, it will be necessary to construct dipping tanks, such as are already in existence in many parts of the West. It is recommended that cattle be dipped twice in the fall and also twice in the spring, with an interval of 10 or 12 days between the 2 dippings. The substances recommended by the author for dipping cattle are chloro-naptholeum and zenoleum. Experiments have been made with these dips on about 7,000 cattle, with favorable results. Both substances were used in a 4 per cent solution. Slightly stronger solutions may be employed. After cattle have been dipped it is recommended that they should not be allowed to lie down in infected corrals.

Brief notes are also given on other lice affecting cattle and a detailed description presented of suitable dipping vats for treatment of large herds of cattle.

Sarcoptic mange of horses has been known in the State since 1895. The symptoms of the disease are described and it is recommended that horses be treated in the same manner as cattle. Good success is reported from a single application of the dip, but in severe cases it is recommended that 2 dips be applied.

Notes are given on the lice which commonly infest hogs, especially *Hæmatopinus urius.* Where hogs become badly infested the easiest method of freeing them of these pests is to dip the animals. It is recommended that hogs be dipped every 3 or 4 weeks, if infested with lice. Notes are given on a number of sheep dips which have been successfully used for dipping sheep and are also recommended for use on hogs.

A critical examination of the position of Dr. Koch on the subject of human tuberculosis, S. Arloing (*Jour. Méd. Vét. et Zootech., 5. ser., 5* (*1901*), *Oct., pp. 577–593*).—This article is controversial in nature and the author seeks to array the many arguments which lead to conclusions contradictory to that of Koch. A report is made on experiments showing that goats, mules, cattle, and rabbits may be infected with tubercle bacilli of human origin. It is argued that the virulence of tubercle bacilli may vary to a considerable extent under different conditions and that this variation of virulence in different animals does not necessarily indicate different species of bacteria, but merely variations of the same species under different conditions of growth and development.

Report of the tuberculosis commission, C. H. Cook (*New Jersey State Bd. Agr. Rpt. 1901, pp. 223–226*).—The tuberculosis commission has continued to make examination of dairy cows which constitute the dairy herds within the State. Such examination was made in all cases where application has been made according to law so far as the appropriation permitted. During the year 1901 the total number of applications for examination was 190; the number of animals comprised in these herds, 2,512; and the number condemned, 342. The total indemnity paid for animals destroyed was $7,260.75. The tuberculin test has also been made upon all cattle imported from other States.

Serum diagnosis in tuberculosis, G. Carrière (*Compt. Rend. Soc. Biol. Paris, 53* (*1901*), *No. 25, pp. 746, 747*).—From numerous observations made by the author it is believed that this method is subject to some practical difficulties and requires special training for its application. It is an extremely sensitive method and gives the same results in young and old patients.

On the subject of sensibilizing substances in the serum of tuberculous patients, J. Camus and P. Pagniez (*Compt. Rend. Soc. Biol. Paris, 53* (*1901*), *No. 25, pp. 734, 735*).—In samples of serum obtained from tuberculous patients the presence of a sensibilizing substance causing, to some extent, the disappearance of alexin was determined. This phenomenon was not observed in every instance, but it is believed to be of general occurrence.

Tuberculin as a diagnostic of tuberculosis in cattle, J. Smith (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 14* (*1902*), *pp. 166–171*).—On account of the number of failures of a reaction from tuberculin in cattle which were subsequently found to be tuberculous, further investigation of the subject was made by J. M. Young, who presents a report on 42 cattle which were tested with tuberculin. Of the 42 cows which were tested, 21 were found after slaughtering to be tuberculous, and of these only 17 had reacted to the test. It is recommended that in using the tuberculin test the temperature should be taken at least 4 times after inoculation, viz, at 9, 12, 15, and 18 hours after injection. In cases where the temperature appears to be gradually rising at the last period, it is recommended that it be taken subsequently, 21 hours after the inoculation.

The tubercle bacillus in feces, D. Anglade (*Compt. Rend. Soc. Biol. Paris, 53* (*1901*), *No. 28, pp. 829, 830*).—According to observations by the author tubercle bacillus is almost always found in the feces, in cases where the intestines are involved in the progress of tuberculosis. Brief notes are given on a means of identification of tubercle bacillus in feces. These observations are considered of importance from a sanitary standpoint.

Lecithin in tuberculosis, H. Claude and A. Zaky (*Compt. Rend. Soc. Biol. Paris, 53* (*1901*), *No. 28, pp. 821–823*).—Experiments with tuberculous guinea pigs and man showed that the use of lecithin does not directly check the development of tuberculosis, but that it modifies the nutritive processes favorably; under its influence the weight of the body increases, metabolic processes become more active, and the elimination of phosphorus is considerably diminished.

The action of urea on cultures of tubercle bacillus in bouillon and on tuberculous guinea pigs, RAPPIN (*Compt. Rend. Soc. Biol. Paris, 53* (*1901*), *No. 24, pp. 691–693*).—In the experiments reported in this article the author added variable proportions of uric acid, urate of soda and urea to flasks containing from 100 to 120 gm. of the bouillon ordinarily used in the culture of tubercle bacillus. The proportions of these different substances varied between 10 cgm. and 2 gm. to 100 or 120 gm. of the bacillus. In the numerous experiments which were made the results were uniform. The action of the uric acid, even in strong doses, appears to be nil. The flasks to which this substance was added showed a growth of the tubercle bacillus equal to that of check flasks. The same results were obtained in experiments with urate of soda. The fact that the uric acid had no influence on the tubercle bacillus was at first explained by the slow solubility of this substance, but urate of soda is readily soluble. Quite different results were obtained in experiments with urea. Flasks containing tubercle bacillus to which urea, even in small quantities, was added, showed a slow and meager development as compared with check flasks. It is suggested that the action of urea in these cases was similar to that of an antiseptic.

Combating bovine tuberculosis, H. RAQUET (*L'Ing. Agr. Gembloux, 12* (*1901*), *No. 4, pp. 187, 188*).—Brief notes on measures recently adopted in Gembloux for the eradication of tuberculosis. The author recommends thorough application of the tuberculin test in fighting this disease.

Experimental plastic spinal meningitis caused by the toxin of the tubercle bacillus, ARMAND-DELILLE (*Compt. Rend. Soc. Biol. Paris, 53* (*1901*), *No. 31, pp. 885–887*).—A study was made of the influence of toxin obtained from an ether extract of the tubercle bacillus and inoculated into the spinal cord. The experimental animals were dogs. It was found that when the toxin was inoculated into the membranes of the spinal cord a plastic inflammation of these membranes was set up which, in its functional symptoms and anatomical lesions, resembles the course of tuberculosis. During the author's experiments with this toxin anatomical changes were produced similar to those observed by Auclair in the lungs. Further experiments are promised with a chloroform extract.

Anthrax, D. PUGH (*Farmer's Gaz., 60* (*1901*), *No. 40, p. 734*).—The symptoms of anthrax in horses, sheep, cattle, and pigs are described. It is recommended that as soon as an outbreak of the disease is noticed, the animals should be immediately removed from the pasture, in order to prevent its further contamination. The necessity of destroying carcasses of animals dead of anthrax is urged.

Recent work on blackleg, T. KITT (*Monatsh. Prakt. Thierh., 13* (*1901*), *No. 4, pp. 174–189, figs. 8*).—The author presents a critical review of recent literature on this subject, in connection with bibliographical references to some of the important contributions.

Pathological histology and bacteriology of labial actinomycosis in cattle, Z. F. ELENEVSKI (*Arch. Vet. Nauk, St. Petersburg, 31* (*1901*), *Nos. 9, pp. 793–813; 10, pp. 873–896, pls. 3, figs 2*).—The author reviews the literature on this subject in great detail. Statistics were collected from various cities in Russia and other parts of Europe showing the prevalence of actinomycosis during recent years, especially since 1895. Particular attention is devoted to the study of the labial form of the disease. The proportion of actinomycosis of the lips to the total number of cases of actinomycosis in cattle was found to be as follows: In Moscow 37.9 per cent, in Tiflis 85.9 per cent, in Elisabetgrad 81.6 per cent, in Nijni Novgorod 5.5 per cent, in Ekaterinoslav 13.9. The pathological changes caused by infection of actinomycosis in the lips are described in elaborate detail. Experiments were tried with the organism, which was isolated, from actinomycotic tumors, and it was found that within 15 days after inoculation in the mucus membrane of the lower lip, a tubercle appeared and gradually increased in size until it became a large tumor at the end of 3 weeks. A careful study of the organism showed that it differed in many histological and cultural characters from ordinary bacteria. The organism grew better upon acid media than on neutral or slightly alkaline media. The author concludes that the organism belongs to the mold fungi, rather than to bacteria proper.

Reappearance of cattle plague and the results of preventive inoculation in South Africa, A. THEILER (*Monatsh. Prakt. Thierh., 13 (1901), No. 4, pp. 145–161*).—Cattle plague caused great losses in South Africa during the years 1896 to 1898, and as a result of this outbreak, bile and serum inoculations were applied on a large scale. The preventive inoculations of bile proved exceedingly effective and the disease was apparently eradicated. A few cattle, however, in various parts of the country were not inoculated. In May, 1891, an outbreak of the disease occurred in Basutoland and in the Orange River Colony. Many authorities have maintained that immunity produced by inoculations of bile persisted for only from 4 to 6 months. An investigation of this outbreak, however, showed that those animals which were inoculated with bile in 1897 still retained their immunity. In studying the latest outbreak it appeared that almost all cases of the disease occurred in young animals, and very few cases were observed in cattle over 4 years old. In several herds outbreaks occurred during which many calves died, but none of the older animals which had been inoculated 4 years before became infected. The author concludes that bile inoculation is to be recommended as a preventive measure, in herds where no cases of the disease have occurred, and also in infected herds. Many technical objections have been raised against the method, but it has proved itself practical and efficient, as judged by the results. The effect of this method in producing immunity has been so striking that many of the natives who at first could not be prevailed upon to allow preventive inoculation in their herds, have more recently had all their animals inoculated.

Treatment of malignant catarrhal fever of cattle with colloidal silver, TRAEGER (*Ztschr. Veterinärk., 13 (1901), No. 1, pp. 23–25*).—In a case of this disease, as soon as the symptoms became sufficiently pronounced to enable the author to make a certain diagnosis the colloidal silver preparation was administered. The substance was injected twice per day intravenously, in doses of 50 gm. in a ½ per cent solution. On the second day improvement was noted in the animal and ultimately complete recovery was brought about. During the whole treatment the animal received 300 gm. of the silver preparation. The injections were made partly in the jugular vein and partly in a more superficial vein.

Iodid of potash as a prophylactic treatment for parturient paralysis, A. KRAGERUD (*Berlin. Thierärztl. Wchnschr., 1901, No. 40, p. 598*).—The author obtained favorable results from the use of iodid of potash in the treatment of parturient paralysis, either by infusion into the udder or by intravenous injections Experiments were made for the purpose of testing the value of this substance as a preventive of the disease, when given by way of the mouth. For this purpose cows were selected which were considered especially susceptible to the disease and were kept in stalls in which cases of the disease had frequently occurred. A few hours before parturition each cow was given 8 gm. of potassium iodid in ½ liter of water, and the dose was repeated after from 12 to 20 hours. Of the 100 cows treated in this manner only 2 developed symptoms of the disease, so that the iodid of potash had to be given as an infusion into the udder. Several animals showed preliminary symptoms of the disease after the first administration of the iodid of potash, but recovered without serious development.

Report of the commission for combating foot-and-mouth disease (*Arch. Deut. Landw. Raths, 25 (1901), pp. 179–280*).—This report contains a detailed discussion on the presence and extent of foot-and-mouth disease in the various parts of Germany. A special report was made on the spread of the disease during the years 1886 to 1899 in various parts of the country. Numerous tables are given showing the number of cattle affected in different provinces and the extent of importation and exportation of cattle. The commission recommends the following measures in controlling foot-and-mouth disease: Prohibition of the importation of ruminants and hogs, raw products of these animals, or other material which may serve to carry the contagion from countries which are infected with the disease. At times when no cases of the disease are known certain regulations are recommended as necessary to be observed in order to prevent as far as possible all outbreaks of the diseases. These measures include careful inspection of stock yards, slaughterhouses, stock trains, steamboats, and stock markets. It also recommended that all stalls and yards which are subject to infection from the disease should be regularly disinfected. In cases of outbreak of foot-and-mouth disease it is recommended that any delay or neglect in notifying the authorities should be punished with heavy penalty, that strict quarantine conditions should be maintained, and that none of the animals in quarantine or any of their products should be allowed to be moved from the place of quarantine until the most thorough process of disinfection has been carried out.

The intercantonal agreement concerning the enforcement of simple regulations for combating foot-and-mouth disease, J. EHRHARDT (*Schweiz. Arch. Tierh., 43 (1901), Nos. 3, pp. 115–123; 4, pp. 162–173*).—Regulations for the control of this disease have been formulated in 20 sections. The author gives a critical explanation of the meaning and purpose of each of these sections.

A new cure for foot-and-mouth disease, A. H. DELLSCHAFT (*Agr. Gaz.* [*London*], *54 (1901), No. 1456, p. 351*).—The author gives an account of the treatment for this disease as recommended by Baccelli. The treatment consists in the intravenous injection of corrosive sublimate. In calves, 2 to 4 cgm. are to be administered, according to the severity of the attack; in adult cattle, from 4 to 8 cgm., according to size. The solution of corrosive sublimate should contain 75 mg. of common salt for each centigram of corrosive sublimate.

On braxy, D. J. HAMILTON (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 14 (1902), pp. 314–347, figs. 3*).—This disease is especially prevalent among sheep and is identical with the disease known as bradsot in Teutonic countries. The author gives a historical review of the literature on this disease and discusses the general problems concerned with its diagnosis and nature. Braxy has a peculiar and limited distribution. It appears to affect only European sheep and is most prevalent on the West coast of Norway and of Scotland, and in Iceland. It is also prevalent on some of the small islands north of Great Britain. The number of deaths among sheep in certain seasons has been as great as 15 to 20 per cent. The symptoms are frequently not observed, since braxy usually runs its course very quickly. The breathing becomes somewhat labored and the temperature is elevated to from 105 to 108° F. It is observed that the disease is most apt to attack young animals—lambs after weaning appear to be most susceptible—while animals at 2 years of age are seldom attacked and 3-year-old sheep are almost quite exempt. The greatest prevalence of the disease is observed during the late autumn and early winter months, although occasional instances of braxy appear during the summer. Detailed descriptive notes are given on the post-mortem findings in 6 cases of natural infection of braxy. The pathological changes found in these cases agree closely with 3 other cases produced by artificial infection. Braxy bacillus was readily found in all cases and is described with reference to its various morphological and physiological characteristics. The method of natural infection is not well understood, but it is believed that the bacillus is inhaled in a dry condition. Work is being done at present for the purpose of developing an effective preventive treatment for this disease.

Acinous tumors of the gall bladder in cattle, ZELLHUBER (*Monatsh. Prakt. Thier., 13 (1901), No. 2–3, pp. 97–120, pl. 1, figs. 4*).—The anatomical characteristics of this disease are described in detail for 6 cases. The author concludes that the mechanical friction of the tumorous swellings of the gall bladder prevents the disappearance of the condition of inflammation and often renders this condition more acute. In cases where the acini are numerous gall concretions may be formed which may obstruct the cystic duct and cause colicy symptoms.

Investigations on the cutis of the hoofs of cattle, H. HOHMANN (*Monatsh. Prakt. Thierh., 13 (1901), No. 2-3, pp. 49-96, figs. 12*).—On account of the numerous diseases which affect the hoofs of cattle it was considered desirable to make a further study of the anatomical structure of the hoofs of cattle. The author reviews the literature on the subject and describes the general appearance of the hoof, cutis, and subcutis in cattle. The microscopic structures, including the blood vessels and nerves which are distributed in these parts, are described in detail. A bibliography on the subject is appended.

Serum agglutination as a means for diagnosing glanders, C. O. JENSEN (*Berlin. Thierärztl. Wchnschr., 1901, No. 41, pp. 621-625*).—The author discusses in detail the difficulties which are ordinarily met in making a rapid and certain diagnosis of glanders in suspected horses. The lack of a strictly differentiating method of staining the glanders bacillus renders its identification by ordinary bacteriological methods rather difficult. In testing animals with mallein the author considers it necessary to distinguish between animals which show only a slight elevation of temperature and in which no other general symptoms are manifested after injection with mallein; animals which show an irregular reaction, with a temperature of 39 to 40° C. of short duration and with loss of appetite and some swelling at the point of injection; and animals which show a specific reaction with a temperature of 40 to 41° C., appearing after a period of from 8 to 10 hours and persisting for from 12 to 24 hours. A brief account is also given of the method of diagnosing glanders by means of inoculating susceptible animals, such as guinea pigs, with material from suspected animals. Several experiments were made by way of testing the reliability of agglutination as a diagnostic sign of glanders; during these experiments it was found that the agglutination test is far more reliable than mallein injection. It is not urged that this method should entirely replace the use of mallein, but it is believed that the agglutination test can be judiciously used in cases where the mallein injection gives doubtful results.

Diagnosis of glanders, N. K. GADZYATZKII (*Arch. Vet. Nauk., St. Petersburg, 31 (1901), No. 9, pp. 823, 824*).—For making a definite diagnosis in suspected cases the author prefers inoculation of cats with material taken from discharges of ulcers in the nose or on other parts of the body. Where no ulceration has taken place, the submaxillary glands were removed and cats were inoculated with material from these organs. This method of diagnosis was considered very certain and does not require more than three days for a definite result.

Acute epizoötic leucoencephalitis in horses, W. G. MACCALLUM and S. S. BUCKLEY (*Maryland Sta. Bul. 80, pp. 67-76, pls. 3*).—The authors made a further investigation of a disease which has been more or less prevalent for a number of years in Maryland and which has passed under a number of names, such as staggers, horse disease, and cerebro-spinal meningitis. The usual symptoms are drowsiness, imperfect vision, partial paralysis of the throat, twitching of the muscles of the shoulder, and unsteady gait. The temperature varies between 96 and 103° F. Usually the animals become more and more stupid and sometimes delirium is observed. The course varies from a few hours to a week, and is fatal in a large percentage of cases. Horses which recover exhibit defective intelligence. Post-mortem examinations were made on the brains of 4 animals which were affected with acute cases of the disease. On either side in the frontal region of the brain a softened area was observed, and was confined to the white substance. No bacteria were found in these areas. The cultures which were tried gave negative results. An inoculated rabbit remained perfectly well. When examined microscopically, affected tissues showed that greater or less changes had taken place in the nerve cells and fibers, neuroglia, blood vessels, and lymphatics. Clear hyaline masses which stained blue were found in the small blood vessels in the affected areas. The walls of these vessels had undergone extensive inflammatory changes. Various other details of pathological changes in the affected tissue are given. Another extensive outbreak of the disease occurred in southern Maryland, during which a number of horses died. Three autopsies were made, but no macroscopic lesions were observed. When examined under a microscope, however, blood vessels in the brain substance showed inflammatory changes in certain areas. No cultures could be made with the material from these cases. A rabbit which was inoculated by material from 1 case which had been dead 48 hours died with infection of a bacillus belonging to the hog-cholera group. This bacillus requires further study, but it is not believed that it is connected with the disease.

Pneumonia and vaccination, REINLÄNDER (*Ztschr. Veterinärk., 13 (1901), No. 2, pp. 53–62*).—A serious outbreak of pneumonia in epizootic form occurred in a number of regiments of army horses. The symptoms of the disease are described in detail and the post-mortem appearance of animals upon which anatomical examinations were made. Numerous experiments were tried in vaccinating animals for the purpose of preventing the development of pneumonia, or curing it. Of the animals which were not vaccinated 14.3 per cent became later infected with the disease, and of those which were inoculated 6.3 per cent contracted pneumonia. In considering all the experiments the author concludes that the present method of vaccination for preventing the development of pneumonia is of little value. It is believed that further investigation should be made for the isolation and identification of the microorganism of the pneumonia of horses before better results in vaccination can be obtained.

Equine malaria, A. THEILER (*Schweiz. Arch. Tierh., 43 (1901), No. 6, pp. 253–280, pls. 2, fig. 1*).—In studying the pathogenic organism of this disease the author noted its similarity to the organism of human malaria, but considers it a distinct species, which is described under the name *Plasmodium malariæ equorum*. Notes are given on the microscopic characteristics of the parasite and on methods which are most successful in preparing and staining it. The influence of local conditions, time of year, and susceptibility of various horses to the disease are discussed. A detailed account is given of the characteristic symptoms and the method for making a certain differential diagnosis. The number of parasites in the blood is greatly diminished by the administration of quinine. It is recommended that quinine be given at least 3 times a day in doses of 6 to 10 gm. A bibliography on the subject is added to the article.

The appearance of colic in consequence of rusty barley straw, MIERSWA (*Ztschr. Veterinärk., 13 (1901), No. 8–9, pp. 378–380*).—Several cases of colic appeared among army horses, and an investigation of the outbreak disclosed the fact that these horses had been fed on barley straw which was infected with rust of 2 species (*Puccinia graminis* and *P. rubigovera*). As soon as this forage was abandoned the outbreak of colic ceased. Brief notes are given on the therapeutic treatment which was given during the progress of the disease.

The pathogenesis of roaring in horses, THOMASSEN (*Monatsh. Prakt. Thierh., 13 (1901), No. 5, pp. 193–230, figs. 8*).—The author gives a critical review of the large mass of literature on this subject. The anatomy of the larynx is described and the various theories which have been proposed for explaining the occurrence of this disease are discussed. A review of all the literature on this subject leads to the conclusion that the disease is still far from being well understood. It is believed that a microscopic study of those parts of the nervous system which are concerned with the disease may yield better results. Attention should be given not only to the recurrent nerve, but also to the vagus, accessory, and medulla oblongata.

Disinfection of stables with steam, KRAMELL (*Ztschr. Veterinärk., 13 (1901), No. 7, pp. 316, 317*).—In an outbreak of pneumonia among horses an experiment was made to determine the value of steam disinfection of stables in which the disease occurred. The steam was applied in as careful and thorough a manner as possible. As a result of these experiments it is concluded that steam is an efficient disinfectant, provided it is applied at a temperature of not lower than 100° C. In order to produce that temperature, however, in large stables the ordinary apparatus in common use is insufficient, and it is considered that this method must therefore be abandoned in the disinfection of stables.

Observations on the chicken plague which was introduced into Oldenberg from the Brunswick Chicken Exposition, L. GREVE (*Deut. Tierärztl. Wchnschr., 9 (1901), No. 37, pp. 373–376*).—Post-mortem examination of fowls dead with this disease showed no pathological changes in the stomach. The blood vessels of the intestines were somewhat injected. Small red spots were observed on the heart and peritoneum. The bacillus of chicken cholera could not be demonstrated in the blood or other organs. Inoculation experiments with blood from the heart of a hen dead with the disease produced no infection in pigeons or white mice. Feeding experiments with infected material, however, caused the development of the disease in sparrows and pigeons. While the identity of the disease is not definitely determined, it is recommended that the same precautions be observed as are usually recommended in outbreaks of chicken cholera.

Brief statistics, M. STREBEL (*Schweiz. Arch. Tierh., 43 (1901), No. 5, pp. 210–220*).—The author presents in a tabular form a list of the diseases which were treated in his practice during the past year. The number of cases of each disease are given and the animals affected. Brief mention is made of some of the more important diseases which are discussed by the author in the body of the article. Verminous bronchitis was observed in 43 calves and young cattle varying in age from 8 to 16 months. The animals were grazing on wet pastures. In the treatment of this disease the best results were obtained by causing the animals to inhale a mixture of 4 parts of ether and 1 part oil of turpentine. This mixture was administered 3 times per day, a spoonful being poured into the nasal cavity. The author makes a report on 9 cases of actinomycosis, 6 of which were localized in the tongue and 3 in the thyroid and laryngeal glands.

Report of the State board of health, H. MITCHELL (*New Jersey State Bd. Agr. Rpt. 1901, pp. 229–234*).—Brief notes are given on the cases of infectious diseases reported to the board of health during the year 1901. These diseases include 52 cases of glanders, 18 of tuberculosis, 4 of hydrophobia, 6 of bovine varicella, and 3 cases of supposed anthrax which were not definitely identified.

AGRICULTURAL ENGINEERING.

Irrigation department, S. FORTIER (*Montana Sta. Bul. 32, pp. 57–71*).—This is the report of the irrigation department of the station for the year ended June 30, 1901, and includes an account of observations on seepage losses from 5 irrigation canals and ditches, the duty of water for various crops in 1899, the amounts of water required by different crops in 1900, the discharge of the principal rivers of Montana in 1900, and an explanation of the importance of equitable division of water under cooperative canals.

Report on irrigation in South Africa, W. WILLCOCKS (*Agr. Jour. Cape Good Hope, 20 (1902), Nos. 3, pp. 161–169; 4, pp. 241–249, figs. 2; 5, pp. 286–294, fig. 1; 6, pp. 344–351; 7, pp. 391–397; 8, pp. 449–455, figs. 2; 9, pp. 502–513, figs. 2, maps 2*).—A discussion of conditions affecting irrigation in South Africa, and especially recommendations to the high commissioner regarding the policy to be pursued in "the recently acquired crown colonies of the Orange River and Transvaal." Proper provision by the State for irrigation, particularly the construction of storage reservoirs, is considered necessary to a normal development of the agriculture of the region, which has remained largely pastoral and undeveloped on account of the limited amount and irregularity of the rainfall. It is maintained that rivers and torrents should be declared public domain, as has been done in Italy, and reservoirs for the storage of their waters should be built by the State, a part of the profits of the mines being utilized for that purpose, and the State being reimbursed by water rentals.

Recent developments in Punjab irrigation, S. Preston (*Jour. Soc. Arts, 50 (1902), No. 2584, pp. 602–616, figs. 2*).

Farmers' weirs, S. Fortier (*Montana Sta. Bul. 34, pp. 29, figs. 5*).—A popular description of the construction and use of various devices (weirs) for measuring irrigation water, with tables for calculating the results in miners' inches.

Agricultural machines at the Paris Exposition, 1900, Albert and Schiller (*Arb. Deut. Landw. Gesell., 1901, No. 65, pp. 59, figs. 104*).—A brief general discussion.

Second report on the highways of Maryland, H. F. Reid and A. N. Johnson (*Maryland Geol. Survey, 4 (1902), pp. 95–201, pls. 6, figs. 2*).—This report includes an account of operations during 1900–1901, laboratory work, special road improvement, summary of road expenditures in different counties of the State, contract and specifications for two roads, and report of the Baltimore County roads engineer.

Horse and cattle barns built in 1901, E. G. Schollander (*North Dakota Sta. Rpt. 1901, pp. 92–98, figs. 5*).—These barns are frame structures 2 stories high, standing on brick foundations. The main part of the horse barn is 45 ft. wide and 106 ft. long, with a small wing 10 ft. long and 45 ft. wide on the west side, and on the east a wing 36 ft. wide and 100 ft. long, which forms the horse stable proper. The first floor of the main structure contains a stock-judging room, harness and carriage rooms, etc. The west wing contains an office and a workshop. The east wing is equipped with stalls, racks, etc. The second floor of the main building contains attendants' rooms, feed rooms, etc. The main part of the cattle barn is 135 by 37 ft. "It holds two rows of stock facing the center, with a 5-ft. feed passage through the middle. The feed passage connects with the silo, which allows the ensilage to be thrown into a small truck and drawn through the passage way between the mangers as it is fed to the stock. On the east is a projection 10 ft. long by 32 ft. wide, containing an office, a stair footing, and a milk room. On the west is a large wing 50 ft. long by 37 ft. wide, with two rows of box stalls of different sizes, stairs, watering trough, and closets. The building has 16-ft. studding throughout." The stalls used are of the Bidwell pattern and are of different sizes. The second floor has feed bins, attendant's room, and haymows.

The silo, which is separate from the barn, "is round in form and is 24 ft. in diameter, inside measurement. The wall is made of brick, 28 ft. high and 20 in. thick, with a dead-air space in the center of it. The floor and wall are cemented with the best grade of cement. A dormer window in the silo roof serves as an intake for green corn or other material with which the pit is filled. A second dormer window on the opposite side of the roof furnishes light."

Hay and sheaf sheds, R. Henderson (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 14 (1902), pp. 105–147, figs. 40*).—The construction and advantages of such sheds are discussed.

Compacting effect of plow teams upon the furrow, J. H. Shepperd (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 113, 114*).—Observations with a platform scale in a barn floor showed that a horse weighing about 1,350 lbs. in walking exerted a pressure of about 640 lbs. with the hind foot and 700 lbs. with the front foot. The average surface of the feet of the horse was about 31 sq. in., the length of stride 34 in. It is estimated that the stride in pulling a plow would probably be two-thirds of this distance. On this basis it is estimated that if no portion of the ground is stepped upon a second time "the entire surface would be pressed in 5 times plowing."

Comparative experiments in cooling refrigerator cars by means of ice or ammonia, V. Storch and H. P. Lunde (*50. Rpt. Kgl. Vet. Landbohöjskoles Lab. Landökon., Forsög [Copenhagen], 1901, pp. 58*).

MISCELLANEOUS.

Annual Report of Idaho Station, 1901 (*Idaho Sta. Rpt. 1901, pp. 27*).—This includes a report of the director on the publications and work of the station during the year, departmental reports reviewing the different lines of work at some length, and a financial statement for the fiscal year ended June 30, 1901.

Eighth Annual Report of Montana Station, 1901 (*Montana Sta. Bul. 32, pp. 71*).—This includes a financial statement for the fiscal year ended June 30, 1901; a report of the director on the work, staff, and publications of the station; a list of exchanges, and departmental reports, parts of which have already been noted from other publications (E. S. R., 13, pp. 271, 676) or are noted elsewhere in this issue. Of 201 samples of food examined by the chemist 94 were found adulterated.

Fourteenth Annual Report of New York Cornell Station, 1901 (*New York Cornell Sta. Rpt. 1901, pp. XLVI+466*).—The report proper includes the organization list, a report of the director, a summarized financial statement for the fiscal year ended June 30, 1901, and departmental reports reviewing the different lines of work during the year. Appendix I contains reprints of Bulletins 183–193 of the station on the following subjects: Sugar-beet pulp as a food for cows (E. S. R., 12, p. 878); the grape-root worm, a new grape pest in New York (E. S. R., 12, p. 974); the common European praying mantis, a new beneficial insect in America (E. S. R., 12, p. 973); the sterile fungus Rhizoctonia as a cause of plant diseases in America (E. S. R., 13, p. 55); the palmer worm (E. S. R., 13, p. 68); spray calendar (E. S. R., 13, p. 372); Oswego strawberries—an account of experiment with fertilizers, and records of strawberry growing, in the Oswego district (E. S. R., 13, p. 354); three unusual strawberry pests and a greenhouse pest (E. S. R., 13, p. 371); tillage experiments with potatoes (E. S. R., 13, p. 342); further experiments against the peach-tree borer (E. S. R., 13, p. 369); and studies of some shade tree and timber-destroying fungi (E. S. R., 13, p. 468). Appendix II contains a detailed financial statement for the fiscal year ended June 30, 1901. Appendix III contains reprints of Nature Study Quarterlies Nos. 6–9, Reading Lessons for Farmers Nos. 10–15, eight numbers of the Junior Naturalist Monthly issued during 1900–1901, Reading Lessons for Farmers' Wives Nos. 1 and 2, and a circular of information concerning cooperative experiments.

Director's report for 1901, W. H. JORDAN (*New York State Sta. Bul. 211, pp. 435–450*).—This is an extended review of the work of the station during the year. The more important results obtained along the different lines of investigation are enumerated.

Twelfth Annual Report of North Dakota Station, 1901 (*North Dakota Sta. Rpt. 1901, pp. 112*).—This includes a brief report of the director, departmental reports, parts of which are noted elsewhere, an account of the work at the Edgeley substation, and a financial statement for the fiscal year ended June 30, 1901.

Fourteenth Annual Report of Vermont Station, 1901 (*Vermont Sta. Rpt. 1901, pp. 193–380+XLV*).—This includes the organization list of the station, a financial statement for the fiscal year ended June 30, 1901, a report of the director containing a list of available station publications and an outline of work during the year, abstracts of Bulletins 81–87 issued during the year, and departmental reports containing in addition to summaries of the different lines of investigation miscellaneous articles abstracted elsewhere.

Organization lists of the agricultural colleges and experiment stations in the United States with a list of agricultural experiment stations in foreign countries (*U. S. Dept. Agr., Office of Experiment Stations Bul. 111, pp. 130*).—This includes the organization lists of the Office of Experiment Stations and the agricultural colleges and experiment stations in the United States with a list of station publications received during 1901; lists of the officers of the Association of American

Agricultural Colleges and Experiment Stations, the Association of Official Agricultural Chemists, the Association of Economic Entomologists, the Association of Veterinarians of Experiment Stations, and of the American Association of Farmers' Institute Workers; and a list of the agricultural experiment stations in foreign countries with a list of the publications received from such institutions during 1901.

Experiment Station Work—XX (*U. S. Dept. Agr., Farmers' Bul. 149, pp. 32, figs. 6*).—This number contains articles on the following subjects: The value of muck or peat, improved culture of potatoes, the farmer's vegetable garden, the shrinkage of farm products, transplanting and manuring muskmelons, soils for strawberries, fertilizer requirements of strawberries, plum culture, methods of growing onions, the digestibility of raw, pasteurized, and cooked milk, the dairy cow and the weather, and feed mills and windmills.

The card index of experiment station literature (*U. S. Dept. Agr., Office of Experiment Stations Circ. 47, pp. 2*).—A brief description of the card index of experiment station literature and a statement of the terms of sale.

The station bulletin, J. B. Weems (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 75–88*).—This is a discussion on the bulletins of the experiment stations based upon replies received from editors of agricultural journals and from officers of experiment stations. The author considers that there is need of a government publication similar to the Experiment Station Record for publishing original articles by station workers.

The farmer and his education, or the farmer as an educated specialist, W. J. Beal (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 19–25*).

Subdivision of agriculture for purposes of instruction and research, E. Davenport (*Proc. Soc. Prom. Agr. Sci. 1901, pp. 160–162*).

Agricultural imports and exports, 1897-1901, F. H. Hitchcock (*U. S. Dept. Agr., Section of Foreign Markets Circ. 24, pp. 16*).—Statistical tables are given showing in detail the agricultural imports and exports of the United States during each of the 5 fiscal years 1897–1901.

Cotton in Egypt (*U. S. Consular Rpts., 68 (1902), No. 256, pp. 43, 44*).—Statistics showing the annual production of Egyptian cotton in the last 15 years, the average price for each year, and the countries to which the staple was exported.

Sugar industry of Saxony, B. H. Warner, Jr. (*U. S. Consular Rpts., 68 (1902), No. 256, pp. 83, 84*).—A brief account of the status of the industry is given, together with statistics for the years 1882–1900, inclusive.

Clearing new land, F. Williams (*U. S. Dept. Agr., Farmers' Bul. 150, pp. 24, figs. 7*).—This bulletin deals in a popular style with the proportion of uncleared land in the United States, the land which may be profitably cleared, the cost and methods of clearing land with practical illustrations, the cultivation of new land, and crops adapted to such lands.

NOTES.

Alaska Stations.—F. E. Rader and J. W. Neal have been sent to the Copper River Country to make a temporary reservation for an experiment station. It is expected that a site will be chosen, ground broken for seeding to fall grains, and a residence and barn constructed during the summer. At the close of the season Mr. Rader will return to Sitka, while Mr. Neal will remain at the new station. Reports from Kenai show favorable weather and crops doing well. At Sitka the outlook is favorable for a good harvest.

California University and Station.—Dr. Leroy Anderson, recently elected superintendent of the San Luis Obispo Polytechnic School, will continue in charge of the dairy department for the coming year. A large dairy barn is being constructed at the station. Studies of the peach worm, conducted in Placer County by W. T. Clarke, in cooperation with the county board of horticultural commissioners, are about completed. Similar cooperative work on the red spider of the orange is being conducted in Los Angeles County by C. W. Woodworth, assisted by W. H. Volck and the county board.

Colorado College.—J. A. Stump, assistant in physics and civil engineering, has resigned, to continue his studies. A. P. Greenacre, assistant in mechanical engineering and drawing, has also resigned. The college has adopted a plan of scholarships and fellowships. A limited number will be appointed as scholars, who will receive increased pay, and rank as fellows the second year.

Connecticut Storrs College and Station.—Rufus W. Stimson, professor of English literature and oratory and acting president of the college since last September, has been elected president of the college. L. A. Clinton, of Cornell University, has been appointed director and agriculturist.

Connecticut State Station.—Dr. G. P. Clinton, of the University of Illinois, entered upon his work as botanist of the station July 1.

Florida College and Station.—H. E. Stockbridge, Ph. D., agriculturist, has severed his connection with the institution.

Georgia Station.—S. H. Fulton, biologist and horticulturist of the station, has resigned to accept a position in the Bureau of Plant Industry of this Department.

Iowa College and Station.—Dr. W. M. Beardshear, president of the college, died at Ames August 5, 1902. Dr. Beardshear was born in Ohio, November 7, 1850. In 1864 he enlisted in the Army and served to the end of the civil war. He then entered Otterbein University, and after graduating with distinction from a classical course at that institution, in 1876, devoted two years to post-graduate work at Yale in Hebrew and Greek philosophy and theology. Leaving Yale, he engaged in ministerial work in his native State, and in 1882 accepted the presidency of Western College, at Toledo, Iowa, which he held until 1889, when he was called to Des Moines as superintendent of the city schools. Dr. Beardshear was president of the Iowa Agricultural College from 1891 until his death. A year ago he was elected president of the National Educational Association, and during the annual meeting of this organization at Minneapolis several weeks ago he suffered an attack of illness from which he did not recover. He was appointed U. S. Indian Commissioner by President McKinley in

1897. W. J. Kennedy has been made vice-director of the station, and Alfred Atkinson assistant in agronomy. A. T. Erwin, assistant in horticulture, has resigned. The part of the main building remaining after the fire of December 8, 1900, was destroyed by fire August 13, 1902. The office furniture and plant collections of the botanical department of the college and station, contained in the building, were saved. The loss is estimated at $10,000.

Maine Station.—Herman H. Hanson, a graduate of the Pennsylvania State College in 1902, has been appointed assistant chemist, vice Ora W. Knight, resigned.

Massachusetts College and Station.—F. A. Waugh, horticulturist of the Vermont college and station, has been elected horticulturist of the college and station to succeed S. T. Maynard. Thorne M. Carpenter, a graduate of the college, who was recently assistant chemist at the Pennsylvania Station, has been appointed assistant in the department of foods and feeding.

Michigan College and Station.—E. E. Bogue has been appointed professor of forestry. R. C. Kedzie, for nearly forty years at the head of the chemical department, has retired from active service in the college as professor emeritus, but remains in charge of the chemical work of the station. Robert S. Shaw of the Montana College and Station has been elected to the chair of agriculture in the college, vice H. W. Mumford, who is now connected with the Illinois College and Station. J. J. Ferguson has resigned as instructor in animal husbandry to accept a position with the Live Stock Commission at Winnipeg.

Minnesota University and Station.—Andrew Boss has been promoted to associate professor of agriculture in charge of live stock. Coates C. Bull, assistant in agriculture in the University of Illinois, has been appointed assistant in agriculture. He will have charge of rural engineering and will assist in field crops. John Thompson, professor of agriculture and chemistry in the Agricultural and Mechanical College for the Colored Race, at Greensboro, N. C., has also been appointed assistant in agriculture. He will assist in field crops and farm management. J. F. Wojta, a recent graduate of the University of Wisconsin, has been appointed assistant in agriculture, with his main work in rural school agriculture. Prof. W. M. Hays has been placed in charge of the new movement to introduce agriculture into the rural schools. A bulletin nearing completion will contain about two hundred exercises and experiments. This bulletin is to be bound and furnished to each rural school. It outlines exercises which the teacher is to require of pupils, at such times as may be convenient and practicable. Each exercise includes, besides the subject and time when it can best be carried out, four divisions. Under the first heading is a statement of the object sought; under the second, the materials to be used; under the third, the plan of work; and under the fourth are notes giving important facts to the teacher. The subjects include agriculture, horticulture, cooking, sewing, domestic animals, housekeeping, laundering, agricultural chemistry, dairying, etc. The State department of public instruction has employed W. Robertson, J. F. Wojta, and J. A. Wilson to introduce the use of these exercises to the teachers in the teachers' summer schools throughout the State. Reading lessons, charts, and other helps to teaching agriculture in the rural schools are contemplated.

Missouri College.—R. M. Bird, recently assistant chemist of the Mississippi college, is acting professor of agricultural chemistry.

Ohio Station.—P. J. Parrott, until recently assistant entomologist of the New York State Station, has been appointed entomologist of the Ohio Station.

Rhode Island College.—J. H. Washburn of the college resigned August 15, 1902. Pending the appointment of a new president, H. J. Wheeler, director of the experiment station, is acting president. *Science* notes that President E. R. Nichols of the Kansas College has been elected to succeed Dr. Washburn.

South Carolina College and Station.—H. S. Hartzog, president of the college and director of the station, has resigned to accept the presidency of the University of Arkansas, vice J. L. Buchanan, who retired on account of failing health.

South Dakota Station.—Appropriations made at the last session of the legislature have enabled the station to purchase a herd of dairy cows for experimental purposes. Cross-pollination experiments with fruits and grains are being conducted at the station.

Utah Station.—E. G. Gowans, biologist, and J. A. Wright, horticulturist, have resigned, the former to engage in the practice of medicine, and the latter to edit the *Inter-mountain Farmer and Ranchman*, published at Salt Lake City. W. D. Beers has been made assistant irrigation engineer, and R. Stewart, assistant chemist. A vegetation house has been built at an expense of $1,500. Experiments on the reclamation of alkali lands by means of tile drainage are being conducted near Salt Lake City, in cooperation with the Bureau of Soils. Irrigation experiments near the station are also in progress.

Vermont University and Station.—Cyrus G. Pringle, of Charlotte, Vt., the well-known botanical explorer and collector of Western American and Mexican plants, has transferred his herbarium to the University of Vermont and State Agricultural College, and has accepted an appointment as keeper of the herbarium of that institution. The botanical library and herbarium of C. C. Frost have also been transferred to the same institution. These collections, with some previously there, give the University the largest collection in New England, outside of Harvard University, and in quality one of the finest in the world. W. Stuart, associate horticulturist of the Indiana Station, has been appointed horticulturist, vice F. A. Waugh, resigned. B. O. White, assistant chemist of the station, has resigned.

Virginia College and Station.—John Spencer, D. V. S., has been elected professor of veterinary science in the college, vice E. P. Niles, resigned. J. G. Ferneyhough, D. V. S., has been appointed veterinarian of the station and assistant professor of veterinary science. Meade Ferguson, Ph. D. assistant professor of agriculture, will have charge of the classes in bacteriology. C. W. Harrison has been appointed assistant chemist, vice J. B. Huffard, resigned.

Washington College and Station.—S. W. Fletcher has resigned his position as horticulturist.

West Virginia Station.—T. C. Johnson, formerly a fellow in botany, has been elected instructor in botany and assistant horticulturist to the station.

Wisconsin University and Station.—E. P. Sandsten, of the Maryland College, has been elected associate professor of horticulture to succeed E. S. Goff, whose death was recently announced. George A. Olson has been elected assistant chemist to the station.

Experiment Stations in Formosa, Japan.—K. Haga, of the department of agriculture of the government of Formosa, who is now in this country, states that there are in Formosa three experiment stations under the direction of Inazo Nitobe, M. A., D. A. S., Ph. D., as follows:

At Taipeh, established 3 years ago, where experiments are conducted with rice, sugar cane, tobacco, and sweet potatoes.

At Taichu, in charge of subdirector S. Aoyagi, B. A. S., established 2 years ago, where attention is given chiefly to the growing of rice, tea, sugar cane, to silk culture, and to cattle and pigs.

At Tainan, in charge of subdirector H. Tojo, B. A. S., established 2 years ago, principally for the culture of sugar cane.

There is also a tea experiment station in Toshiyen.

Agricultural Education in Réunion.—By a decree dated May 23, 1902, a committee has been appointed to formulate and install a system of agricultural education in the primary schools of the island of Réunion.

AGRICULTURAL EDUCATION IN RUSSIA.—A new agricultural school of the intermediate grade has recently been opened near the city of Pskov, Russia. There are now 8 schools of this class under the jurisdiction of the Ministry of Agriculture. The municipality of Pskov granted 850 acres of land to the school, located about 3 miles from town. Agricultural courses for women were opened in May at the Imperial Botanical Garden at St. Petersburg. These courses include horticulture and gardening, dairying, poultry raising, and beet culture. They were organized by the Society for the Promotion of Female Agricultural Education. Forty-eight students have been enrolled, most of whom will take all four of the courses. The same Society for the Promotion of Female Agricultural Education has secured the establishment of similar courses at the Mariinsk Agricultural School.

In addition to these and other means of popular agricultural education, there are held in Russia courses for teachers in primary public schools, which are conducted at agricultural schools during the period of 4 to 6 weeks; courses for educated persons other than teachers, in which the theoretical studies occupy the greater portion of the time; public readings at fairs, museums, meetings of societies, etc.; short courses for peasants and other persons interested in agriculture, lasting 2 to 3 weeks and conducted at some educational institution; and practical agricultural courses for soldiers and such detachments of the army as are located near an agricultural school.

AGRICULTURAL BUDGET OF RUSSIA FOR 1902.—The more important items for agriculture are as follows: Agricultural education, $498,877.20; experiment stations, museums, etc., $165,320.40; increase to the amelioration fund, $200,000; construction of buildings, etc., $144,000; irrigation work, $107,200; subsidies to societies, institutions, and private persons for useful agricultural enterprises, $90,904; reclaiming marshes and putting up of peat for fuel purposes, $75,148; development and encouragement of village industrial handicraft, $72,000; development and encouragement of certain industrial branches of agriculture, $55,700; combating phylloxera and other injurious insects and animals, $50,400; and publications, $41,354. The appropriation for agricultural education is an increase of $20,400 over the previous year, to cover the expense of a new agricultural middle school and some agricultural schools of lower grade.

ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS.—It is announced that the nineteenth annual meeting of the Association will be held in the lecture hall of Columbian University, Washington, D. C., October 2–4, 1902.

MISCELLANEOUS.—*Revue bibliographique des sciences naturelles pures et appliquées* has been discontinued. A movement is on foot to publish matter pertaining to agriculture in the *Bulletin de l'office des renseignements agricoles.*

Prof. Dr. Emil Chr. Hansen celebrated the twenty-fifth anniversary of his connection with the Carlsberg Laboratory of Copenhagen on July 1, 1902. His work on the physiology of fermentation is well known.

O

EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*

EDITORIAL DEPARTMENTS.

Chemistry, Dairy Farming, and Dairying—The Editor and H. W. Lawson.
Meteorology, Fertilizers and Soils (including methods of analysis), and Agricultural Engineering—W. H. Beal.
Botany and Diseases of Plants—Walter H. Evans, Ph. D.
Foods and Animal Production—C. F. Langworthy, Ph. D.
Field Crops—J. I. Schulte.
Entomology and Veterinary Science—E. V. Wilcox, Ph. D.
Horticulture—C. B. Smith.
With the cooperation of the scientific divisions of the Department.

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EXPERIMENT STATION RECORD.

VOL. XIV. OCTOBER, 1902. No. 2.

The experiment station at Möckern, Germany, the first of its kind in the world, celebrated the fiftieth anniversary of its establishment September 20. The occasion was one for general congratulation, and is of special interest to all friends of the experiment station enterprise. The date selected for the exercises was that of the annual meeting of the German Association of Experiment Stations, which was held this year at Leipzig, only a few miles distant from Möckern. Prof. Oskar Kellner, the present director of the station, had prepared a *Festschrift*, or historical address, which was printed in advance, reviewing the incidents in the establishment of the station, its gradual development and present status, and summarizing its principal lines of work. This is a bound volume of over two hundred pages, with several plates showing the station buildings. Congratulatory addresses were made by members of the association, followed by a banquet.

The Möckern Experiment Station has had many admirers in this country, and especially in the early days of the experiment station movement it was much written about. It is therefore one of the best known of the German stations. As it marks the beginning of the experiment station as a public institution, the history of its establishment is of unusual interest.

Lawes and Gilbert in England and Boussingault in France had for several years carried on systematic and continuous field experiments, supplemented by laboratory work; and Liebig had, through his field and laboratory studies and his generalizations in science, aroused much interest in the fundamental principles underlying plant and animal nutrition. The publication of his works led to an agitation among agriculturists in Saxony, which some ten years later resulted in the establishment of the experiment station. A first step in this direction was the providing by the Saxon government of a chair of agricultural chemistry in the Forestry and Agricultural Academy at Tharand, in 1847. In the efforts to secure an experiment station which followed, the leaders were Secretary Reuning, of the General Agricultural Society, and Dr. Wilhelm Crusius, who was the president of the oldest agricultural society in Saxony (the Leipzig Economic Society, founded in 1863) and a lessee of its farm at Möckern. Crusius was a firm believer in the importance of chemical investigation to agriculture, and had already erected a laboratory on his own account.

Through the influence of these men plans were laid for the establishment of a station, to be located on the farm of the Leipzig Economic Society and the adjoining lands of Dr. Crusius. The Saxon government committed itself to the undertaking and promised an appropriation for its maintenance, and the Leipzig Economic Society agreed to assume the expense of fitting up the first laboratory building. In October, 1850, it was announced that Dr. Emil Wolff, then an instructor in the agricultural school at Brösa, had been selected for director; and in the following January he entered upon his new duties with the practical agriculturist Bähr, formerly administrator of the society's farm, as an associate. A year and a half elapsed, however, before the State government made an appropriation for the station, and it was not until December 28, 1852, that the institution was definitely established. In the meantime it was maintained by private means, largely supplied by Dr. Crusius.

This year, accordingly, marks the fiftieth anniversary of the station as a State institution. The act of its establishment defines its purpose to be "to extend the knowledge of the practice of agriculture and the industries connected with it by means of scientific investigation, closely associated with practical experiments of various kinds, and to disseminate the useful results thus obtained." The programme laid out for it in this act covered the whole field of agricultural experimentation, but it was naturally found necessary to confine operations within a comparatively restricted field.

Wolff remained as director only three years, when he was called to the Agricultural Academy at Hohenheim, where he remained to the close of his life. He was followed by Dr. H. Ritthausén, later a prominent authority on albuminoids, who left after two years to establish a new station; and he in turn was followed by Dr. Wilhelm Knop, who remained ten years. On the latter's call to the chair of agricultural chemistry in the University of Leipzig, Dr. Gustav Kühn, a pupil of Henneberg's and at that time director of the experiment station at Brunswick, assumed the directorship. Kühn remained at the head of the station for nearly 25 years, from 1867 to 1892, when he died. The following year the present director was appointed.

Although the Möckern Station has been since 1867 primarily a station for investigation in animal physiology, it now embraces four additional divisions, each presided over by a separate officer, one for the analysis of fertilizers, another for the examination of feeding stuffs, agricultural products, waters, etc., a third for soil studies, for judging of the quality of soils, their cultural relations, laying out of estates, etc., and a fourth for vegetation experiments, to study the fertilizer requirements of Saxony soils. Its working force consists of the director, 11 scientific assistants (9 chemists, 1 botanist, and 1 agronomist), several clerks, and 4 laborers.

Until 1879 the station occupied buildings furnished by the Leipzig Economic Society on its Möckern estate. In that year it was placed under the control of the State government, and an endowment made by Dr. F. Crusius (son of the founder) was used for a new building. The Government also leased the Möckern estate for a term of fifty years, so that the station was placed upon a more permanent and independent basis. It is now one of the best supported of the German stations and ranks among the foremost in its work.

The Möckern Experiment Station is to be congratulated upon its long (relatively speaking) and noteworthy career. It holds a peculiar relation to the experiment station movement, which has gradually spread from country to country. In the early days it was the guiding star. It blazed a path in a new field when few men had faith in its utility and the foundation of agricultural science was hardly laid. It has shown what an experiment station may accomplish for both the science and the practice of agriculture; and by the dignity and high character of its work it has commanded the respect of the farmer and the man of science alike. Its example has led directly to the establishment of a large number of other stations, and the sphere of its influence has extended far beyond the confines of its own country.

It is especially fortunate that the first State station should have been so successful in demonstrating its value to the public. A failure might have delayed indefinitely the spread of the movement whose beginning it marks. The fifty years which have elapsed since it entered upon its work in so meager a way have witnessed the establishment of a system of stations as State or Government institutions in practically every civilized country. These have steadily grown in strength and in importance until now they may be ranked as among the permanent institutions of civilized nations, as much as the schools and universities. They are fostered alike under the republic and under the unlimited monarchy, and are recognized by all enlightened peoples as constituting an essential element in national welfare. Rarely indeed has one been abandoned or its maintenance funds permanently diminished.

Surely no class of institutions make a better return for the money intrusted to them or reach more directly with their influence a larger proportion of the people in whose interest they are laboring.

We are called upon to record the death of Prof. Arthur Petermann, director of the Agricultural Experiment Station at Gembloux, Belgium, which occurred August 26. Professor Petermann was widely known as an agricultural chemist and investigator, and was one of the pioneers in experiment station work in Europe. He was prominently identified with the development of the experiment station system in Belgium from its beginning, being called to Gembloux in 1872 to organize and take charge of the first station. He developed the system of analytical laboratories, of which there are now seven, and for many years was director-general of experiment stations. The Gembloux Station became the capstone of the Belgian system, being devoted to research work and determining the methods to be employed and other matters of policy relating to the analytical laboratories.

Professor Petermann was born in Dresden July 14, 1845, and graduated at the University of Göttingen. After serving as assistant in the Weende (Göttingen) and Pommritz experiment stations, he spent two years at the Nancy (France) Station as chemist. In 1872 he became director of the Gembloux Station, at present known as the Royal Institute of Chemistry and Bacteriology, and in the latter position was also professor in the Royal Agricultural Institute, with which the station is connected.

Professor Petermann's investigations covered a very wide range, but dealt more particularly with the chemistry of plant production. To a large extent they involved studies of the methods of investigation. He made numerous contributions on the methods of agricultural analysis, his method for available phosphoric acid being familiar to all agricultural chemists. He was one of the first to conduct systematic soil investigations with a view to preparing popular "agronomic" charts, showing the character of the soil, its needs, and its adaptability to different crops. He was a leading spirit and authority on all matters relating to agricultural investigation in Belgium, and the success of the State laboratories was due in large measure to his influence. Most of the directors of these laboratories were trained under him at Gembloux.

Professor Petermann was a constant contributor to the scientific serials and published several books and pamphlets. He contributed an article to this journal, published in volume five, on the Belgian system of experiment stations. His most important published work is his Researches on Chemistry and Physiology as Applied to Agriculture (*Recherches de chimie et de physiologie appliquées a l'agriculture*). This appeared in three volumes, and is largely a record of his agricultural investigations.

The death at Woburn, Mass., on October 1, 1902, of Mr. J. R. Dodge, for many years Statistician of this Department, removes one who, during a long life of unremitting activity, devoted his best energies to the services of agriculture and to building up the Department.

When the Department of Agriculture was but a division of the Patent Office, Mr. Dodge was already engaged in its service, but it was not until September 4, 1863, some few months after its organization as a separate Department, that he received his appointment as a clerk. In 1867 he was commissioned as Statistician, but in addition to taking charge of the statistical work of the Department, he also served as its editor, a position for which his early experience in journalism and in the printing business especially qualified him. The early annual reports were edited by him, as were also the monthly reports, which latter, after the growth of the Department had compelled the publication of special bulletins from the several divisions, became the regular monthly reports of the Division of Statistics, the principal feature of which was the crop report, and which included a very large amount of miscellaneous and valuable statistical matter.

In his statistical work, for which he possessed special qualifications, he soon became eminent among American statisticians and held a foremost place in all statistical matters relating to agriculture.

Mr. Dodge surrendered his commission in the Department June 30, 1879, and served for some time as the chief of a division in the Tenth Census, under Gen. Francis A. Walker. He returned to the Department, resuming his former place as Statistician July 1, 1883, and held that office until he resigned, March 20, 1893. After that time Mr. Dodge devoted himself to miscellaneous writing along the line of his chosen study, contributing many valuable articles to sundry periodicals and agricultural papers, to some of which he remained an active contributor until the time of his death.

During his more than thirty years of official service he not only won the esteem and confidence of his associates, but he made his mark before the public at large as a man of rare attainments, broad views, sound judgment, and sterling integrity. He enjoyed in a marked degree the confidence of the several Commissioners and Secretaries under whom he served, and was a frequent and always intelligent adviser, not only in the line of his specialty but in many matters connected with the work of the Department. He several times represented the United States at international agricultural and statistical gatherings, the last occasion being at Budapest.

Through all he was an unassuming man, and only those who have made a study of the history and development of the Department of Agriculture can realize what a large part he took in building it up.

The late Prof. Rudolph Virchow, although preeminently an investigator in the domain of medical science and pathology, made notable contributions, at least indirectly, to the progress of agriculture. His work touched that field of applied science at various points. As the founder of modern pathological methods he exerted a profound influence on all subsequent investigation on the diseases of domestic animals, as well as of human beings. His theory of cellular pathology has been one of the most important and fundamental factors in the development of modern medicine. He was deeply interested in the application of the teachings of science to problems of municipal sanitation and public health; and as the leading spirit of the municipal council of Berlin he instigated and supervised the introduction of a sanitary water supply and a healthful system of sewage disposal, which have made that city an object lesson to many others. "Modern Berlin is a splendid monument of his zeal in the service of humanity."

His work was not without important bearing on the physiology of human and animal nutrition, and his *Archiv für pathologische Anatomie und Physiologie*, which he established in 1847 and continued to edit to near the close of his life, contains frequent contributions on the principles underlying the metabolism and use of food nutrients.

Indeed so broad and varied was the field of Virchow's activity that it is difficult to measure his influence or to fix bounds within which it was exerted. Agricultural science may fairly claim to be one of its beneficiaries, and the methods of research which he outlined and the spirit which characterized his work will continue a guide and inspiration in this field, as well as in medical science.

CONVENTION OF ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS, 1902.

H. W. LAWSON,
Office of Experiment Stations.

The nineteenth annual convention of the Association of Official Agricultural Chemists was held at Columbian University, Washington, D. C., October 2-4, 1902. The meetings were presided over by the president, H. J. Wheeler, of Rhode Island. In opening the convention the president called attention to certain changes in the order of business adopted at the last annual meeting and to the recognition of the association by Congress in the appropriation act which empowers the Secretary of Agriculture, in collaboration with the association and other experts, to fix standards for food products, required in the execution of pure-food laws.

All of the referees for the year were present and submitted reports, and in addition several interesting papers were read. The change in the policy of the association, taking effect at the present convention, whereby matters not of "minor importance or of urgent necessity" are to be reported upon by committees on recommendations of referees for consideration at the next convention, apparently affected to some extent the character of the proceedings. The discussion of the reports and papers was not extended, and no very important matters were acted upon. The assignment of subjects to different committees on recommendations of referees caused some confusion and resulted in no consideration in committees during the convention of some of the reports. About 100 chemists and visitors were in attendance. Hon. James Wilson, Secretary of Agriculture, Charles W. Needham, president of Columbian University, and Charles E. Munroe, professor of chemistry in Columbian University, were present upon invitation and addressed the convention. Secretary Wilson spoke of the work of the Department along several lines, President Needham of the attraction of Washington for scientists and of the dignity and value of the work of scientific men, and Professor Munroe of the value of agreement upon methods of analysis by the association.

PHOSPHORIC ACID.

The report on phosphoric acid was read by the referee, C. H. Jones. Different methods for the determination of available phosphoric acid in basic slag were compared. The lowest results were obtained by the ammonium citrate method and the highest by the Macfarlane method, in which the free lime is removed from the slag by means of ammonium chlorid before treatment with citric acid. The determinations ranged from 4.54 to 10.90 per cent. The referee considered it desirable to agree upon the percentage of the total phosphoric acid available in a sample of basic slag of standard composition and fineness. The advisability of continuing work on basic slag was discussed, but no action was taken.

NITROGEN.

The report of the referee on the determination of nitrogen was submitted by F. W. Morse. Comparisons were made of the neutral permanganate method as modified by Street and the alkaline permanganate method as modified by Jones for the determination of available organic nitrogen in fertilizers. The materials selected for distribution to analysts were dried blood and cotton-seed meal combined with superphosphate. Results from 12 analysts were received. In the determination of total nitrogen the weight of evidence favored a longer period of digestion than usual. Duplicate determinations of availability by any one analyst agreed well, taking each method by itself. The two methods in comparison, however, gave widely varying results, and neither was thought to give the available nitrogen. The referee recommended further study of the two methods, which was adopted. The recommendation was also adopted that in reporting analyses of complete fertilizers the amounts of nitrogen existing in the form of nitrates, organic nitrogen, and ammonium salts be so stated.

In the discussion of nitrogen determination G. W. Cavanaugh reported favorably upon the use of both mercuric oxid and potassium sulphate and upon reversing the order of adding potassium sulphid and sodium hydroxid as given in the official method. The advantage gained in the latter procedure is in adding the potassium sulphid to an alkaline solution and thereby avoiding an evolution of hydrogen sulphid. Distillation with steam was found very efficient in preventing bumping.

The report on the separation of nitrogenous bodies was read by the referee, L. L. Van Slyke. Work along this line was confined to the proteolytic products of cheese and milk and consisted in devising and testing methods of separation and estimation. Credit is given to E. B. Hart, of the New York State Station, for a large part of the work. Methods for the separation and estimation of the nitrogen compounds of cheese were described and discussed under the following headings: Obtaining sample; determination of total nitrogen; extraction of water-soluble products; determination of total water-soluble nitrogen; determination of nitrogen in the form of paranuclein, proteids coagulable by heat in neutral solution, caseoses (albumoses), amido-acid compounds, peptones, ammonia, and unsaturated paracasein lactate. Methods for the determination of nitrogen in milk in the form of casein, albumin and syntonin, caseoses, amido-acid compounds, peptones, and ammonia were also given. The referee recommended that the methods presented be adopted as provisional methods under the head of dairy products.

The association, upon motion of Dr. Van Slyke, authorized the appointment of a committee of three as referees to take charge of the work relating to the separation of nitrogen compounds, the work to be distributed among the members of the committee on the following lines: (1) Meat proteids, (2) vegetable proteids, (3) milk and cheese proteids.

POTASH.

The report on this subject was read by the referee, H. B. McDonnell. Results from 14 analysts on the determination of potash by the Lindo-Gladding and milk-of-lime methods and a modification of the alternate method used by the referee were reported as well as determinations of moisture in potash salts. The different methods gave quite concordant results and showed a loss of potash in mixed fertilizers of about 7 per cent of the total amount present. The referee recommended further work for the purpose of getting a method of dissolving all the potash in mixed fertilizers, and also further experiments with methods for the determination of moisture in potash salts, which suggestions were adopted.

A paper by C. L. Hare on the determination of potash in fertilizers by substituting milk of lime for ammonia and ammonium oxalate as the precipitant was read by B. B. Ross. "The modification possesses several advantages over the Lindo-Gladding method. First, the precipitation of lime is immediate, and there is no delay at this point. Second, evaporation to expel ammonia salts is eliminated. Third, probable loss of potash during the evaporation is obviated. Fourth, washing the potassium platinic chlorid with alcohol and ammonium chlorid 'wash' may be performed thoroughly with greater ease and rapidity, while no larger amount of platinum is required than by the Lindo-Gladding method." The modification is not applicable to fertilizers containing ammonium salts. The milk of lime and the Lindo-Gladding methods were compared on 60 samples of fertilizers containing no organic materials, the results showing a maximum difference of 0.27 per cent in 58 determinations and less than 0.20 per cent in 46 determinations. The two methods were also compared on fertilizers containing organic matter. In 53 determinations in which the samples for both methods were ignited with sulphuric acid the extreme difference was 0.48 per cent, 41 samples showing a variation less than 0.20

per cent. In 63 determinations in which the samples for the lime method only were ignited with sulphuric acid the results showed an extreme variation of 0.29 per cent and less than 0.20 per cent in 46 comparisons. In 45 determinations without ignition the extreme variation was 0.55 per cent, nothing being claimed for the milk-of-lime method under such conditions.

SOILS.

The report on this subject was made by the referee, F. P. Veitch. The work during the year consisted in the determination of available phosphoric acid and available potash in soils and the analysis of alkali soils and crusts. The 8 samples of soil used in the phosphoric acid and potash work were obtained from 6 States and were representative of different kinds of soil. Each had a full crop and fertilizer history for a number of years. Determinations of available phosphoric acid and potash made by the referee and C. C. Moore with the N-200 hydrochloric acid method showed sufficient harmony with crop history to warrant further trial of the method. The necessity of determining available plant food to the full feeding depth of plants was recognized by the referee, but he was unable to take up this line of work during the year. A letter from Milton Whitney, Chief of the Bureau of Soils, dealing with the value and methods of mechanical analysis and the work of the Bureau in the classification of soils based upon physical examination, was read by the referee, who had been instructed by the association to consider the subject of mechanical analysis. Professor Whitney pointed out the advantages of adopting the grades already in use by the Bureau, namely, fine gravel, coarse sand, medium sand, fine sand, very fine sand, silt, and clay, calling attention to the fact that over 3,000 analyses had been published by the Bureau and that the soil survey work had been extended to 30 States. The points which received attention by the referee in the study of methods for the analysis of alkali soils were the effect of dilution upon the amount of salt dissolved and titration methods for the determination of carbonates, bicarbonates, and chlorids. "The results may be summed up as follows: The concentration of the solution materially affects the speed of solution of sulphates, particularly calcium sulphate, and it is quite evident that equilibrium has not always been reached in 24 hours. The chlorin determination is the most satisfactory and appears to be the least affected by the concentration of the solution, while equilibrium is usually reached within the 24 hours. The determination of carbonates and of bicarbonates when present in large quantities has not been very satisfactory to the referee."

Studies in nitrification were reported in a paper read by G. S. Fraps. Two kinds of tests were made, one in which nitrification was carried out in soil as it came from the field and the other in sterile soil inoculated with active soil. Under uniform conditions as regards moisture, temperature, and plant food, soils showed a variable rate of nitrification attributed to stages in the life history of the nitrifying organisms. Differences in the power of soils to induce nitrification in sterile soil provided with nitrogenous substances and kept under favorable conditions were considered dependent upon an increase in the number of organisms present and upon an increase in their activity. Variations in the comparative rate of nitrification of cotton-seed meal and ammonium sulphate in sterile soil inoculated with different soils pointed to variations in the organisms themselves. Based upon the work recorded in detail in the paper, methods were proposed for determining the relative nitrifying power of soils.

A paper on "A Quantitative Method for Determining the Acidity of Soils," by C. G. Hopkins, W. H. Knox, and J. H. Pettit, was read by Dr. Hopkins. The method, which is based upon the reaction occurring when solutions of mineral salts are added to acid soils, has been used in pot and field experiments at the Illinois Experiment Station during the past year, and "it is asserted with confidence that it can be relied upon to give trustworthy results." The addition of lime to soils in quantities indicated by the method was found to neutralize the acidity. The advantages of determining accurately the quantity of lime to apply to acid soils were pointed out. The method of determining acidity used in the Bureau of Soils was described by F. P. Veitch. The influence of soil and meteorological conditions upon the yield and character of crops was discussed by H. W. Wiley, who concluded his remarks as follows: "Agricultural chemistry, passing from having determined what the soil is and what plants are and how fertilizers can be made and applied, is now advancing to a still higher plane of investigation, to determine how the soil shall be made maximum in production and how the conditions of growth shall secure the maximum of desirable qualities."

The recommendations were adopted by the association that the N-200 hydrochloric acid method be given further trial, that samples for the determination of available phosphoric acid and potash be taken to a greater depth than at present, that virgin soils be used in investigations, that the determination of the acidity of soils be referred to the referee, and that methods for the analysis of alkali soils be further studied, with a view to ascertaining the most desirable amount of soil and the amount of water to be used in dissolving the soluble salts.

DAIRY PRODUCTS.

The referee on dairy products, G. W. Cavanaugh, reported on work done in his laboratory during the year on the determination of albumin in milk. On fresh samples the present official and provisional methods gave concordant results. On milk preserved with formalin the results were very unsatisfactory. The percentage of albumin in milk decreased from 0.525 per cent in fresh samples to 0.157 per cent in samples preserved for 4 days with formalin. Other tests showed that formalin tends to prevent the coagulation of albumin by heat, the amount of formalin added and the time that it is in contact with the milk both affecting the coagulability. No recommendations were made. The referee was instructed to study further the effect of preservatives upon albumin in milk.

FOODS AND FEEDING STUFFS.

The work on feeding stuffs reported by the referee, C. A. Browne, jr., was practically along lines followed by preceding referees, and consisted mainly in the determination of moisture, fat, and pentosans in samples of timothy hay and distillers' grains according to the official methods and in the comparison of the official and König methods for crude fiber on both samples. Based upon results obtained by 9 analysts, the referee recommended a further study of the König method with the additional treatment of the fiber with alkali, as by the official method. The referee also recommended the substitution of Kröber's factors for calculating pentoses and pentosans for those given in the provisional method, which recommendation was adopted.

A paper by E. Gudeman, dealing with the manufacture and analysis of gluten feeds, was read by J. K. Haywood. Methods for the determination of fat and of acidity were compared. In a letter from C. L. Parsons, read by H. W. Wiley, suggestions were made concerning methods for the analysis of malt liquors.

FOOD ADULTERATIONS.

The referee on this subject, W. D. Bigelow, reported that an attempt had been made to have reports on cereal products, tea and coffee, and cocoa and chocolate, the three subjects not completed at the last meeting. Two of the reports were ready. Many of the subjects were subdivided and only parts of the subjects given attention. The referee recommended that provisional methods, embodying the minor changes suggested by the referees, be published. Acting under the advice of the executive committee the referee was authorized to make such assignments of work as he may see fit and to appoint his associate referees. The changes made in the provisional methods adopted at the last convention and published in Bulletin 65 of the Bureau of Chemistry were adopted provisionally.

SUGAR.

The report on sugar was made by the referee, G. L. Spencer, and included a brief outline of the experimental work conducted by his associates, L. S. Munson and L. M. Tolman, a consideration of special methods used in the analysis of sugar beets and raw sugars, and recommendations of changes in the official methods, including the substitution of the German official method for Clerget's method for the determination of sucrose and the adoption of the method of direct weighing of the cuprous oxid, and of several provisional methods, one of which was the inversion at ordinary temperatures with hydrochloric acid in the proportions used in the German official method. Further work along the lines followed during the year was recommended.

Mr. Munson presented in detail the results of his investigations on methods for determining reducing sugars. The work was conducted with a view to simplifying methods and increasing the accuracy of such work. The results showed that the reduction method, in which the suboxid is weighed directly, is accurate. Encouraging results were obtained in experiments to devise a single copper solution for use under uniform conditions with all reducing sugars. Conditions modifying reduction were also studied.

Mr. Tolman read a paper giving the results of his investigations on optical methods for the determination of sucrose. In inversion at ordinary temperatures very satisfactory results were obtained in the use of hydrochloric acid in the proportions given in the German official method. Accurate results were obtained in the use of citric acid for the inversion of sucrose in the absence of acetates. Levulose was not decomposed nor its rotary power affected by this method, which was pointed out as of value in the examination of honey.

TANNIN.

The work done during the year on this subject consisted of comparisons of single and double filter papers in the determination of soluble solids in chestnut and quebracho extracts and of the distillation, Kohnstein-Simand, and charcoal methods for the determination of acids in a union liquor. Results were reported by the referee, W. H. Teas, who recommended several changes in the official methods, including an omission of the moisture determination in extracts, evaporation under identical conditions, and the use of single instead of double filter papers in the determination of soluble solids, and suggested for future work additional experiments on soluble solids, acid determinations, and on the amount of extract to be taken for analysis. Studies of a proposed modification of the charcoal method and of the correction method for the tannin absorption of the filter paper adopted by the International Association of Leather Trades Chemists were also suggested. A charcoal method for the determination of total acidity in liquors was adopted provisionally.

A letter from H. R. Proctor, referring briefly to the proceedings of the last meeting of the International Association of Leather Trades

Chemists, was read by H. W. Wiley, and the appointment of a delegate to the next meeting of this association was authorized.

INSECTICIDES AND FUNGICIDES.

The report on this subject was read by the referee, J. K. Haywood. The work was directed chiefly toward testing methods of analysis collected from various sources and published as Circular 10 of the Bureau of Chemistry. Samples were sent to a number of analysts and results were received from 9 upon Paris green and London purple, 4 upon copper carbonate, 4 upon potassium cyanid, 4 upon soda lye, 2 upon whale-oil soap, 4 upon formalin, and 3 upon tobacco extract, which, with the comments of the analysts, were reported in detail. Based upon the work, the referee recommended the adoption of method I for total arsenious oxid in Paris green, given in the circular referred to above as one of the official methods, and also the further testing of nearly all the other methods given in the circular except methods II (by weighing the residue) and III for formaldehyde, which were recommended to be dropped.

Details of several of the methods were discussed and one or two points brought up were referred to the referee for further study. H. W. Wiley suggested that every unnecessary detail be dropped from methods. J. K. Haywood spoke of the effect of free arsenious oxid in Paris green upon foliage, stating that in experiments it was observed that the presence of 7 per cent was injurious to apples and pears and 4 per cent to young peach trees, and that improperly prepared Paris green and samples in which the Paris green was in a very fine condition also injured the foliage.

ASH.

The report on this subject was submitted by the referee, G. S. Fraps. Methods for the determination of sulphur and potash in plants were further studied. Results by different analysts on corn bran and cotton-seed meal by the nitric acid method and the nitric acid method, modified by the substitution of calcium acetate for potassium nitrate, showed no satisfactory agreement. The results of the nitric acid method were considered too low. Slightly higher figures were obtained for potash by charring and extracting than by ignition with sulphuric acid. The forms in which sulphur exists in plants and the determination of sulphates were discussed, the literature along these lines being reviewed. Sulphur as sulphates was found in oats, crimson clover, cotton-seed meal, and cowpea vines, and absent in corn, green millet, timothy hay, corn silage, and peanuts. In the determination of chlorin three methods were tested, namely, ignition with calcium acetate, fusion with sodium hydroxid, and ignition with sodium carbonate. The calcium acetate method gave low results. The sodium carbonate method gave as accurate results as the sodium hydroxid method, and being shorter and easier, was recommended for adoption.

The association recommended further testing of the fusion method for sulphur and an investigation of methods for the determination of the amount of sulphur in plants which belongs to the ash, and adopted provisionally the method of determining chlorin by ignition with sodium carbonate.

MISCELLANEOUS.

W. Frear, as chairman of the committee on pure-food standards, outlined the work of the committee during the year, which consisted in formulating definitions and standards for foods, none of which, however, were presented. The report was approved and the committee continued.

John Hamilton, secretary of the Pennsylvania State Department of Agriculture, discussed the subject of food standards with especial reference to the work being done in the inspection of foods in his State. Of 5,000 or more samples of food analyzed in two years and a half over 50 per cent were found adulterated. The more extensive testing of food preservatives was urged.

The committee on fertilizer legislation made a brief report on work done in connection with other associations, which was accepted and the committee continued.

OFFICERS AND REFEREES.

The following officers were elected: *President*, R. J. Davidson, Blacksburg, Va.; *vice-president*, M. E. Jaffa, Berkeley, Cal.; *secretary*, H. W. Wiley, Washington, D. C.; *additional members of executive committee*, C. L. Penny, Newark, Del., and A. E. Leach, Boston, Mass.

The referees as announced are as follows: *Phosphoric acid*, B. H. Hite, Morgantown, W. Va.; *nitrogen*—determination, F. W. Morse, Durham, N. H.; separation of nitrogenous bodies—cheese proteids, L. L. Van Slyke, Geneva, N. Y.; vegetable proteids, R. Harcourt, Guelph, Canada; meat proteids, W. D. Bigelow, Washington, D. C.; *potash*, H. D. Haskins, Amherst, Mass.; *soils*, F. P. Veitch, Washington, D. C.; *dairy products*, G. W. Cavanaugh, Ithaca, N. Y.; *foods and feeding stuffs*, F. D. Fuller, Geneva, N. Y.; *food adulteration*, W. D. Bigelow, Washington, D. C.; *sugar*, G. L. Spencer, Washington, D. C.; *tannin*, G. A. Kerr, Damascus, Va.; *insecticides*, J. K. Haywood, Washington, D. C.; *ash*, E. G. Runyan, Washington, D. C.

The associate referees so far announced are as follows: *Phosphoric acid*, C. B. Williams, Raleigh, N. C.; *nitrogen*—determination, E. B. Holland, Amherst, Mass.; *potash*, M. G. Donk, Tallahassee, Fla.; *soils*, C. C. Moore, Washington, D. C.; *dairy products*, G. E. Patrick, Washington, D. C.; *foods and feeding stuffs*, C. G. Hopkins, Champaign.

Ill; *food adulteration*— colors, A. S. Mitchell, Milwaukee, Wis.; saccharine products including confectionery, E. Fulmer, Pullman, Wash.; fruit products, L. S. Munson, Washington, D. C.; wine, G. E. Colby, Berkeley, Cal.; beer, H. E. Barnard, Concord, N. H.; distilled liquors, C. A. Crampton, Washington, D. C.; vinegar, W. M. Allen, Raleigh, N. C.; flavoring extracts, A. L. Winton, New Haven, Conn.; spices, R. E. Doolittle, Lansing, Mich.; baking powder and baking chemicals, F. T. Green, San Francisco, Cal.; meat and fish, M. E. Jaffa, Berkeley, Cal.; fats and oils, L. M. Tolman, Washington, D. C.; dairy products, A. E. Leach, Boston, Mass.; cereal products, A. McGill, Ottawa, Canada; infants' and invalids' foods, H. W. Wiley, Washington, D. C.; vegetables, G. W. Cavanaugh, Ithaca, N. Y.; condiments (other than spices), J. O. LaBach, Lexington, Ky.; cocoa and cocoa products, E. N. Eaton, Chicago, Ill.; tea and coffee, W. H. Ellis, Toronto, Canada; preservatives, W. D. Bigelow, Washington, D. C.; *sugar*— optical methods, L. M. Tolman, Washington, D. C.; chemical methods, L. S. Munson, Washington, D. C.; *tannin*, H. C. Reed, Stamford, Conn.; *insecticides*, J. Emory, Washington, D. C.; *ash*, F. T. Shutt, Ottawa, Canada.

The chairman of the committee on food standards is Wm. Frear, State College, Pa., and the chairman of the commtttee on fertilizer legislation is H. W. Wiley, Washington, D. C.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The determination of perchlorate in saltpeter, A. Dupré (*Jour. Soc. Chem. Ind., 21 (1902), No. 12, pp. 825–827*).—The method proposed is as follows: Heat 10 and 20 gm., respectively, of this salt in nickel crucibles of about 70 cc. capacity fitted with a shallow-dish-shaped, well-fitting cover, to a temperature of 545° C. for one hour. The furnace or air bath recommended for this purpose is the Gilbert modification of L. Meyer's air bath. After cooling the fused mass of 20 gm. dissolve in warm water and transfer the solution to a 200 cc. measuring flask, make up to the mark, and withdraw 25 cc. of the solution for a preliminary determination of chlorin by the Mohr method. After this preliminary test add to a fresh portion of 100 cc. of the solution an amount of standard silver solution (1 cc.=0.001 chlorin) slightly more than sufficient to precipitate all of the chlorin present (as shown by the preliminary test), add 4 cc. of strong nitric acid, and heat on sand bath to the boiling point (but avoiding ebullition) for half an hour. Cool the solution, filter, wash the precipitate thoroughly, add a little persulphate of iron to the clear filtrate, and determine the silver by titration with standard solution of ammonium sulphocyanid according to Volhard's method. Determine the chlorin by the same method in 10 gm. of the saltpeter before heating. "The difference in chlorin before and after heating is the measure of perchlorate present, provided, of course, that no other chlorin compound is present. The titration may be repeated if desired, with the 10 gm. of saltpeter, using the whole of the solution for one experiment."

The determination of total phosphoric acid in Thomas slag, C. Aschman (*Bul. Assoc. Belge Chim., 16 (1902), pp. 140–142; abs. in Chem. Centbl., 1902, II, No. 2, p. 155*).—A slight modification of the author's previously described method (E. S. R., 11, p. 507) is proposed.

Note on the analysis of superphosphates, J. Legrand (*Bul. Assoc. Belge Chim., 16 (1902), pp. 143, 144; abs. in Chem. Centbl., 1902, II, No. 2, p. 156*).—Attention is called to the fact that the cloudiness which appears in water solutions of superphosphates on standing is due to a mixture of iron and aluminum phosphates.

Determination of sulphuric acid in soils, C. B. Williams (*Jour. Amer. Chem. Soc., 24 (1902), No. 7, pp. 658–661*).—A series of determinations of sulphuric acid in soils by the method of the Association of Official Agricultural Chemists, and by a modification of the same method in which the iron and alumina were first removed by precipitation with barium sulphate, are reported, which show that much higher results are obtained by the modified method. This is apparently due to solution of barium sulphate by either the ferric chlorid or aluminum chlorid or by both.

A lime test for soils rich in lime and marls, M. Passon (*Deut. Landw. Presse, 29 (1902), No. 68, p. 562*).—A description, with explanation of method of use, of the Passon apparatus, which has already been noted (E. S. R., 13, p. 319).

The determination of ammonia in waters, O. Emmerling (*Ber. Deut. Chem. Gesell., 35 (1902), p. 2291; abs. in Chem. Ztg., 26 (1902), No. 68, Repert., p. 214; Chem. Centbl., 1902, II, No. 4, p. 298*).—The ordinary method of direct determination of ammonia by means of Nessler's reagent is condemned as inaccurate in presence of protein compounds. In such cases ammonia is best determined in the distillate obtained after the addition of lead hydroxid.

The solubility of dicalcium phosphate in pure water, A. Rindell (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 2, pp. 112–114*).—In a previous article the author showed that dicalcium phosphate was dissolved with decomposition at ordinary temperatures. By repeated treatment with fresh portions of water he succeeded in completely changing a certain quantity of this phosphate into tricalcium phosphate. Schloesing has shown that it may be dissolved without decomposition. Further experiments by the author, reported in this article, confirm his previous conclusions and show that considerable time is required to establish the equilibrium of saturation. With less than 10 gm. of phosphoric acid per liter of water, 252 hours were required for saturation.

Comparative nitrogen determinations by the method of the German Association of Experiment Stations and the Gunning-Atterberg modification of the Kjeldahl method, O. Kellner (*Landw. Vers. Stat., 57 (1902), No. 3–4, pp. 297–304*).—Comparative tests by several cooperating laboratories are reported which show that this modification of the Kjeldahl method is as reliable as the method previously used by the German association. The method is as follows: Heat 1 to 2 gm. of substance with 20 cc. of nitrogen-free concentrated sulphuric acid with the addition of about 1 gm. of mercury until the substance is dissolved (this requires about 15 minutes), then add 15 to 18 gm. of potassium sulphate and heat again, continuing the digestion for 15 minutes after a colorless solution has been obtained. Allow to stand 10 minutes, then dilute with water. With substances which do not foam the potassium sulphate may be added at the beginning of the operation.

A criticism of the official method for the estimation of nitrogen in nitrates, C. A. Mooers (*Univ. Tennessee Record, 5 (1902), No. 4, pp. 263–265*).—Attention is called to the omission of any directions as to the time to be allowed for the solution of the nitrates before adding the thiosulphate in the Gunning modification of the Kjeldahl method. Determinations are reported which indicate that quick solution may be obtained without sacrifice of accuracy by adding from 1 to 2 cc. of water to the fertilizer mixture and allowing it to stand 5 or 10 minutes before the addition of acids. It was also found that by the careful application of heat the nitrate could be dissolved in the acids in 1 or 2 minutes without appreciable loss of nitrogen.

Some experiments with the Kjeldahl method of nitrogen estimation, H. D. Law (*Jour. Soc. Chem. Ind., 21 (1902), No. 12, pp. 847, 848*).—Determinations of nitrogen with and without the use of permanganate are reported to determine the correctness of Nihoul's[1] conclusion that the amount of nitrogen obtained depends largely on the duration of the time of heating after the solution has become clear. The conclusion is reached that "the amount of nitrogen obtained does not increase after a clear solution has been obtained, but until this stage is reached results are always too low." With the use of an oxygen carrier the time of heating is much reduced and the results obtained are less variable.

A source of error from the use of mercury in the Kjeldahl estimation of nitrogen, C. A. Mooers (*Univ. Tennessee Record, 5 (1902), No. 4, pp. 262, 263*).—Attention is called to a marked absorption of ammonia in the condenser of the Kjeldahl apparatus, probably by the mercury carried over into the coils along with paraffin. Analytical data reported indicate that the error from this cause may be considerable, especially if block-tin condensing coils are used. Glass condensing coils or straight tubes are considered cheaper and in other respects preferable to block tin.

The application of Kjeldahl's method of estimating nitrogen in the tanyard as a means of controlling the tanning and finishing of sole leather, J. G. Parker (*Jour. Soc. Chem. Ind., 21 (1902), No. 12, pp. 838–842*).

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[1] Bourse aux Cuirs de Liége, September, 1901.

An easily made and safe dephlegmator for Kjeldahl distillations, W. J. Lovett (*Jour. Soc. Chem. Ind., 21 (1902), No. 12, pp. 849, 850, fig. 1*).

Fixing nitrogen from the air, T. C. Martin (*Amer. Mo. Rev. of Reviews, 26 (1902), No. 3, pp. 338–342, figs. 6*).—A brief account of the process devised and installed at Niagara by C. S. Bradley and D. R. Lovejoy for oxidizing the nitrogen of the air by means of direct-current arcs. It is stated that by this process 70 per cent nitric acid can be produced at a cost of a little less than 1.6 cts. per pound for energy, using a current generated by Niagara water power at $20 per kilowatt.

Report on general work in the chemical laboratory, C. A. Goessmann (*Massachusetts Sta. Rpt. 1901, pp. 104–107*).—This includes a list of miscellaneous materials sent to the station for analysis during the year, and notes on wood ashes, comparing the quality of samples examined during 1900 and 1901.

The potash and phosphoric acid content of the ash of leaves of various kinds of potatoes rich in starch, J. Seisl and E. Gross (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), p. 62; abs. in Chem. Ztg., 26 (1902), No. 64, Repert., p. 202*).—It was found that the leaves of potatoes rich in starch contained more potash and phosphoric acid than those poor in this substance, and this was true regardless of the fertilizing and stage of growth.

Compilation of analyses of fruits, garden crops, and insecticides, H. D. Haskins (*Massachusetts Sta. Rpt. 1901, pp. 132–147*).—Tables are given which show the percentages and relative proportions of the fertilizing constituents of fruits and garden crops, based mainly upon analyses made at the Massachusetts Agricultural College and Experiment Station; also the average composition of various insecticides examined at the same place.

Laboratory apparatus, P. N. Raikow (*Chem. Ztg., 26 (1902), No. 63, pp. 732–734, figs. 6*).—Descriptions are given of filters for hot and cold filtration, wash and absorption flasks for gases, burettes, etc.

Note on a convenient apparatus for the chemical and bacteriological examination of the atmosphere, W. Chattaway and F. M. Wharton (*Analyst, 27 (1902), No. 317, pp. 243–245*).

BOTANY.

Influence of the elementary plant foods on plant growth, A. N. Pearson (*Dept. Agr. Victoria, 1901, June, pp. 14, pl. 1, dgms. 2*).—An account is given of experiments with wheat plants grown in the absence of nitrogen, phosphorus, sulphur, chlorin, iron, lime, magnesium, potassium, and sodium, in porcelain pots filled with sand that had been washed and ignited, the different pots being arranged in series. Each series contained one pot in which all the plant elements were supplied, accompanied by pots in which single elements were omitted. One of the interesting facts brought out in the experiments was the peculiar thin, wiry stems and narrow, straight leaves produced where nitrogen was omitted from the plant food. Where potash was deficient, the plants were characterized by short, weak stems and narrow, pendent leaves. Subsequent to the principal investigation the author conducted an experiment with sand taken from a hill and placed in pots. The untreated soil produced plants of an unmistakably nitrogen-starved type, while soil to which nitrogen had been added produced plants showing a deficiency in the potash.

Investigations on the nutrition of plants by amids, L. Lutz (*Bul. Soc. Bot. France, 48 (1901), No. 7, pp. 325–334*).—Experiments are reported in the nutrition of a number of species of algæ and fungi, different forms of amids being added to the culture solutions in which the plants were grown. The amids tested were formamid, acetamid, propionamid, butyramid, benzamid, salicylamid, asparagin, urea, oxamid, succinamid, and acetanilid. It was found that the amids of the fatty acid series were readily assimilable, while those belonging to the aromatic group could not be successfully used in the nutrition of plants. In every case where there was a production of ammonia in the cultures the fermentation was due to the entrance of secondary organisms. Where there was an absolute absence of micro-organisms the fungi were able to develop without the formation of ammonia, depending upon the amids present in the solution. The soluble ferments secreted by *Aspergillus niger*, *A. repens*, and *Penicillium glaucum* were incapable of transforming the amids to ammonium salts.

The electrical conductivity of plant juices, F. De F. Heald (*Abs. in Science, n. ser., 15 (1902), No. 377, p. 457*).—By using the methods of physical chemistry the author investigated the conductivity of the juice expressed from the leaves, stems, and roots of beets, potatoes, onions, radish, cucumbers, purslane, water lilies, and rough pigweed. Ash determinations were also made for the juices used, and the ash redissolved in distilled water and diluted to the original volume of the juice from which it was obtained. The specific conductivity was determined for the ash solutions. It was found that plant juices are comparatively good conductors, the conductivity being due in a large measure to the dissolved mineral substances, the organic compounds playing a minor part. The conductivity of juice obtained from the roots of plants is always less than that of the juice obtained from the subaerial parts of the plant. The specific conductivity generally increases progressively from the root upward, although in some cases the sap from the stem has a higher conductivity than that from the leaves. In most cases the specific conductivity may be taken as a rough measure of the relative amount of ash present in the different parts of the plant.

The sensory area of the roots of land plants, F. C. Newcombe (*Abs. in Science, n. ser., 15 (1902), No. 377, pp. 454, 455*).—The sensitiveness to external stimuli on the part of roots of land plants has generally been considered as confined to the apex and elongating zone. In nearly all species this would be confined to the first 10 mm. of the apex. In studying the phenomena of rheotropism the author found that the region of the root posterior to the elongating zone is sensitive. To determine the location of the sensory tissue, various parts of the root were shielded from the flow of water by inclosure in glass tubes. The roots of radish, white mustard, buckwheat, sunflower, and popcorn gave rheotropic curves when stimulated at a distance of 10 to 15 mm. from the limit of the elongating zone.

The significance of transpiration, C. R. Barnes (*Abs. in Science, n. ser., 15 (1902), No. 377, p. 460*).—In this paper the author seeks to present a new point of view regarding transpiration. Ordinarily the purpose of transpiration is held to be a double one: First, to cause the influx to the leaves of a large amount of water, thereby supplying the leaves with a sufficient amount of mineral salts; and second, to concentrate the extremely dilute solutions and thus get rid of the surplus water. The author claims that the amount of salts absorbed is dependent upon the living cortex of the rootlets and the mesophyll of the leaves. If the cortex is freely permeable, equilibrium in the distribution of any salt will occur without evaporation from the aerial parts. If, then, evaporation concentrates the solution, the higher diffusion tension of the salt will tend to drive it to those regions where the diffusion tension is lower. This tendency, therefore, would operate against the further supply of that material to the leaves. If the cortical layers of the roots be not freely permeable, the amount absorbed is regulated wholly by protoplasmic activity and is not directly affected by outside supply. The phenomena of selective absorption show that transpiration does not determine the amount of salts absorbed. Wet cell walls exposed to the atmosphere are indispensable for the solution of the necessary gases, the plant being unable to render waterproof the cell walls so long as gas absorption is necessary. Transpiration is, therefore, considered as unavoidable, although in itself a constant menace to the life and activity of the plant. Advantage is doubtless taken of the xylem bundles to facilitate the movement of substances held in solution, but the author claims there is no reason to think that this is essential. In addition to the above, attention is called to the fact that transpiration has also become a protective factor to plants grown in the open, their temperature being kept within reasonable bounds in this way.

The influence of metallic poisons on respiration, E. B. COPELAND (*Abs. in Science, n. ser., 15 (1902), No. 377, p. 454*).—Experiments are reported with Elodea, Callitriche, a crucifer, fish, and frog larvæ, in which copper, zinc, cadmium, silver, and mercury were used as stimulants. It was shown that the respiration may be stimulated by a small fraction of a fatal concentration of these metals. With increasing concentration the evolution of carbon dioxid becomes accelerated, sometimes reaching 25 times that of the normal. The evolution of carbon dioxid continues undiminished after plasmolysis is suspended by the poison. It was found that copper and zinc may cause a considerable evolution of carbon dioxid from specimens of Elodea that have been boiled.

Cyanogenesis in plants, W. R. DUNSTAN and T. A. HENRY (*Proc. Roy. Soc. [London], 70 (1902), No. 461, pp. 153, 154*).—The authors have investigated the nature of the poison contained in young plants of *Sorghum vulgare.* This plant, under the name of guinea corn, durra, etc., is extensively cultivated in tropical countries as a food grain. The young plants have in a number of instances, especially in Egypt, proved fatal to animals, and the authors show that when crushed with water the young plant produces prussic acid. The acid does not appear to exist in a free state, but is produced by the action of the hydrolytic enzym, which is apparently identical with the emulsin of bitter almonds, on a cyanogenetic glucosid, which has been named dhurrin. Dhurrin is said to differ from the amygdalin of bitter almonds and the lotusin of *Lotus arabicus* in being derived from dextrose and not from maltose. The poisonous properties of young plants do not seem to be in any way present in the seeds or older plants. The authors intend to make an investigation of the general problems raised by the occurrence of cyanogenetic glucosids in plants.

A preliminary study of the germination of the spores of Agaricus campestris and other Basidiomycetous fungi, MARGARET C. FERGUSON (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 16, pp. 43, pls. 3*).—A report is given of preliminary studies on the germination of the spores of Basidiomycetous fungi, the principal species used being *Agaricus campestris.* The methods of investigation are described and experimental results given in detail. The effect of various agents on germination is shown, and the author reports having found that the germination of spores of *Agaricus campestris* is favored under cultural conditions if a few of the spores are germinated or if a small portion of the mycelium of the fungus be introduced into the culture. The growth resulting in either case will cause the germination of nearly all the spores in the culture, provided the conditions are such as not to be detrimental to it. A historical résumé is given of investigations along the same line, and a brief bibliography completes the report.

Cell nuclei in some cases of parasitism or intercellular symbiosis, R. CHODAT (*Extr. from Compt. Rend. Cong. Internat. Bot. Paris, 1900, pp. 10*).—The constant presence of many parasites, especially in some of the higher plants, has been taken to be a form of symbiosis and not as parasitism. The author has made a study of the apparent association between fungi and a number of plants to determine the effect of the presence of the organism on the cell and particularly upon the nucleus. In his studies he found that the parasite of *Hippophaës rhamnoides* acts toward that plant in a similar manner as does the organism causing the club root of cabbage. It is a true parasite and destroys the nucleus of the cell. In turn the parasite may be absorbed by the host plant. The fungus parasite occurring as mycorrhiza in certain orchids in the beginning acts as a true parasite, but never to the destruction of the cell nucleus. After having passed a certain stage the plant seems to be able to restore the attacked cells and no permanent injury is inflicted. In the case of leguminous plants the bacterial parasite seems to be present in a true symbiosis, the host tolerating the micro-organism without injury to the nucleus, although in Ornithopus the nucleus was somewhat enlarged.

The root tubercles of bur clover and of some other leguminous plants, G. J. Peirce (*Proc. California Acad. Sci., 3. ser., Bot., 2 (1902), No. 10, pp. 295–328, pl. 1*).—While examining some sections of root tubercles of the bur clover (*Medicago denticulata*), the author was struck by the great difference between cells containing bacteria and those in which there were none. This led to a careful microscopic study of the root tubercles of the bur clover and other leguminous plants to ascertain if possible the real relations of the tubercular organisms to the cells in which they are found. After describing in detail the method of procedure, the author considers the origin and morphology of the root tubercles, their form, distribution, and structure.

Summarizing his results, the author found that bacteria which form root tubercles on leguminous plants are usually slowly motile in artificial cultures, although this proves nothing for their movement through the soil. The proportion of root hairs affected in the case of the bur clover was about 1:1,000. If the bacteria are in contact or close proximity with the young root hairs many infections may occur simultaneously. The root tubercle bacteria enter and infect a root hair by softening or dissolving a portion of the cell wall. There is no evidence whatever that they enter through broken root hairs. The infection thread grows fairly straight through the cortical parenchyma from the root hair to the layer of cells next the outside of the central cylinder of the root. Tubercles are formed only as a result of the stimulating action of the bacteria, and are originated endogenously from the same layer as that which gives rise to lateral roots, hence morphologically they are lateral roots greatly modified by the influence which caused their formation. The growth of the root tubercle is apical and there is little if any secondary growth in thickness. Root tubercles are usually largest and most numerous near the surface of the soil, and it is probable that perennial leguminous plants form few if any tubercles after their roots have penetrated deeply into the soil.

The presence of bacteria in the cells of a tubercle prevents those cells from forming starch. The affected cells are usually larger than normal ones, due to the increased pressure and to the greater irritation. The bacteria cause the degeneration and almost complete destruction of the nuclei of the cells in which they occur. The infection strands grow definitely toward the daughter cells formed by the meristem, and seem to grow toward the nuclei, which they appear to penetrate. Infected cells soon lose their power of division, but not of growth. The presence of the bacteria in the cells of the tubercle is injurious to the cells, the relation being one of true parasitism on the part of the bacteria. The presence of intercellular spaces in the root makes it unnecessary to assume that the bacteria live anaerobically, as has been assumed by some investigators.

In conclusion, the author states that it is difficult to understand how the leguminous plant as a whole can profit by an association which is injurious and finally destructive to the cells in which the bacteria occur.

On the development of root tubercles of leguminous plants, E. Laurent (*Compt. Rend. Acad. Sci. Paris, 133 (1901), No. 26, pp. 1241–1243; reprinted in Prog. Agr. et Vit. (Éd. L'Est), 23 (1902), No. 13, pp. 387, 388*).—Since 1897 the author has been studying the effect of certain fertilizers on the production of root tubercles upon the roots of leguminous plants. The plats have each year received the same fertilizer and have been grown with the same crop successively. One plat was manured with a nitrogenous fertilizer, a second with potash, a third with superphosphate, a fourth with lime, and a fifth with sodium chlorid. The plants experimented with were peas, hairy vetch, common vetches, and lupines. One object of the experiments was to determine whether by continuous cultivation under similar conditions the plants would acquire characteristics resistant to parasites or other biological changes. In

1897 the peas grown on the plat receiving ammonium sulphate produced few tubercles upon their roots, and these were scattered upon the lateral rootlets. Those plants grown on plats receiving potash fertilizers produced abundant tubercles, which were aggregated close to the tap root, and similar results were obtained with superphosphates. Under the influence of large amounts of lime the tubercles were less abundant, but their volume was greatly increased, many of them attaining a diameter of 10 mm. The action of the sodium chlorid seems to be toward the formation of a few small tubercles.

Each year the seed have been saved from each plat separately and reseeded upon the same, the experiment being carried on continually. In 1901 the peas gathered from the plat which had constantly received nitrogenous fertilizers seemed to have lost their ability to form root tubercles in that soil. When seeded in ordinary soil, however, they readily produced root tubercles, showing that after 5 years there had been no important biological change in the plants. For the other plats, seeds harvested year after year and planted again showed no important differences. The action of the hairy vetch and the cultivated vetch did not differ materially from that shown by the peas. With the yellow lupine, however, the results are somewhat different. The well-known action of lime upon this plant was plainly shown in the plats which received that fertilizer. Comparisons were made with beans of several varieties. In the case of the beans, nitrogenous fertilizers seem to stimulate the formation of root tubercles, while tending to restrain their development with the other leguminous species studied. The addition of superphosphate tends to stimulate the production of tubercles upon peas, hairy vetch, common vetch, and particularly on the yellow lupine, but it has a contrary effect with beans.

METEOROLOGY—CLIMATOLOGY.

Eclipse meteorology and allied problems, F. H. Bigelow (*U. S. Dept. Agr., Weather Bureau Bul. I, pp. 166, pls. 3, figs. 24, charts 16*).—This is a report of observations during the total solar eclipse of May 28, 1900, on the effect of the moon's shadow on the earth's atmosphere. It is based upon the records of an expedition to Newberry, S. C.; upon the special meteorological observations at 62 Weather Bureau stations located within 500 miles of the center of the track of totality; upon a considerable number of voluntary observations made within the belt of the umbra, in accordance with instructions from the Weather Bureau; and upon a study of various problems in solar and terrestrial meteorology. "As the outcome of this work there have been made special studies, (1) on the apparatus planned to obtain a large-image picture of the inner corona, while yet employing a telescope of comparatively short focus; (2) on the shadow band phenomena, which appear to be due to meteorological conditions exclusively, and are not to be associated with diffraction on the edge of the moon, and (3) on the variations of the pressure, temperature, vapor tension, and wind caused by the passage of the shadow cone, together with a computation on the number of calories of heat absorbed per kilogram of air."

Meteorological observations, J. E. Ostrander, H. L. Bodfish, and S. C. Bacon (*Massachusetts Sta. Met. Buls. 160, 161, 162, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during April, May, and June. The data are briefly discussed in general notes on the weather of each month.

Report of the department of meteorology and meteorological summary, C. H. Pettee (*New Hampshire Sta. Bul. 87, pp. 130–133*).—A brief report is given of the operations of this department of the station during the year, accompanied by a monthly and an annual summary of observations on temperature, precipitation, snow fall, cloudiness, and direction of wind during the fiscal year ended June 30, 1901, with averages for each month from July 1, 1895, to June 30, 1901, inclusive. The annual summary of these observations is as follows: Temperature (degrees F.)—1900–1901, 45.9; 1895–1901, 45.3; precipitation (in.)—1900–1901, 41.03; 1895–1901, 44.36; snow fall (in.)—1900–1901, 35; 1895–1901, 57.65; number of days on which there was 0.01 in. precipitation—1900–1901, 98; 1895–1901, 100; prevailing direction of wind—1900–1901, northwest; clear days—1900–1901, 135.

Meteorological observations, W. T. Ellis, R. Robertson, S. A. Bedford, A. Mackay, and T. A. Sharpe (*Canada Expt. Farms Rpts. 1901, pp. 60, 61, 335–337, 455, 512, 558*).—A record of the continuation of observations of previous years (E. S. R., 13, p. 228).

Meteorological chart of the Great Lakes, A. J. Henry and N. B. Conger (*U. S. Dept. Agr., Weather Bureau, Meteorological Chart of the Great Lakes, 1902, No. 1, pp. 26, charts 2*).—This is a summary of data relating to the weather during the season of navigation; precipitation in the Lake region, winter of 1901–2; ice during winter of 1901 and 1902; opening of general navigation, season of 1902; wrecks and casualties from January 1 to April 30, 1902; Lake region storm of April 25–26, 1902; a new service by the Weather Bureau (predictions of high north to east winds at Buffalo to raise the ice blockade), and the display of storm warnings on the Great Lakes.

Wind velocity and fluctuations of water levels on Lake Erie, A. J. Henry (*U. S. Dept. Agr., Weather Bureau Bul. J, pp. 22, charts 25*).—"This report deals with the character and frequency of the storm winds that prevail on Lake Erie, the changes in water level produced by them, and the possibility of predicting the occurrence of the most pronounced changes in level at the eastern end of the lake."

A year of weather and trade in the United States, R. De C. Ward (*Pop. Sci. Mo., 61 (1902), No. 5, pp. 439–448*).—The conclusion reached by the author from his study of this subject is that "as the result of the experience of many years, trade is in a condition of such very close and delicate adjustment to the average weather of any particular month, or even week, that 'seasonable,' i. e., normal weather, other things being equal, usually means 'seasonable' trade. . . . When meteorological conditions are unseasonable, trade at once reflects the change, and suffers. Trade is, however, subject to many and widely varying controls; hence the problem of the particular controls which affect it in any one week is a very complex one, and the key is not always, or sometimes even at all, to be found in local weather conditions."

Composition of Barbados rainfall (*Rpt. Agr. Work, Imp. Dept. Agr. West Indies, 1899-1901, p. 2*).—The total amount and the chlorin and nitrogen (total and as ammonia and nitrates) in the rainfall at Dodds Botanic Station for each month from December, 1899, to May, 1901, inclusive, are reported.

Rainfall at the Variety Experiment Stations from December, 1899, to May, 1901 (*Rpt. Agr. Work, Imp. Dept. Agr. West Indies, 1899–1901, pp. 142, 143*).—The number of rainy days and number of inches of rainfall for each month during this period are reported for 11 places in Barbados.

A study on the climate of Tunis, G. Ginestous (*Bul. Dir. Agr. et Com. [Tunis], 7 (1902), No. 24, pp. 251–363, figs. 4, charts 4*).—This is the third communication (E. S. R., 14, p. 16) on this subject and summarizes the available meteorological data for the three summer months, June, July, and August.

Ten years' observations on the influence of the weather on the yield of sugar beets and on the so-called second growth of beets (*Deut. Landw. Presse, 29 (1902), Nos. 53, pp. 452, 453; 54, p. 460*).—A brief discussion based mainly on Rimpau's observations and applicable to German weather conditions.

The gases of the atmosphere, H. F. Keller (*Jour. Franklin Inst., 153 (1902), No. 6, pp. 419–430; 154 (1902), No. 1, pp. 47–57*).

WATER—SOILS.

The significance of phosphates in natural waters, A. G. Woodman (*Jour. Amer. Chem. Soc., 24 (1902), No. 8, pp. 735–743*).—It is claimed that the determination of phosphoric acid in natural waters "by reason of the conversion of organic phosphorus compounds into phosphates through the processes of decay is one which might reasonably be expected to throw considerable light on the question of the pollution of [such] waters." The author has used with success a modification of J. West-Knights'[1] method, evaporating 50 cc. of the water and 3 cc. of nitric acid (sp. gr. 1.07) to dryness on a water bath, and heating the residue in a water oven for 2 hours. The dry residue is taken up in 50 cc. of cold distilled water, 4 cc. of ammonium molybdate (50 gm. per liter), and 2 cc. of nitric acid added, and the color compared with standards made by diluting varying quantities of a standard phosphate solution (1 cc. = 0.0001 gm. phosphorus pentoxid) to 50 cc., and adding the reagents as above. Blank determinations on the distilled water are advised.

Determinations in a large number of samples of water are reported, together with data obtained by the ordinary sanitary analysis of water. These data show that "the amount of phosphate and its variation seem to follow the same general line as the other mineral constituents which either accompany the polluting material or are produced by its decay, especially the nitrates and the chlorids. It is not, however, so delicate an indicator as these. . . . The results obtained by the colorimetric method would seem to indicate that the limit of 0.5 part of phosphorus pentoxid in a million, as given by Hehner for unpolluted waters, is rather low. A safer amount would be 1 part, although the average would doubtless be lower than this."

Artesian waters and irrigation, W. G. Cox (*Agr. Jour. Cape Good Hope, 20 (1902), No. 11, pp. 612–618*).—This article gives data relating to artesian borings in Queensland, with a discussion of the influence of artesian irrigation on the agriculture of that region.

Well waters from farm homesteads, F. T. Shutt (*Canada Expt. Farms Rpts. 1901, pp. 193–196*).—Analyses of 64 samples of water with reference to sanitary condition are reported.

Some excessively saline Indian well waters, J. W. Leather (*Jour. Chem. Soc. [London], 81 (1902), No. 476, I, pp. 887–892*).—Analyses of a number of such waters are reported and their use in irrigation is briefly discussed.

The examination of water from some typhoid-polluted wells, S. Rideal (*Analyst, 27 (1902), No. 317, pp. 245–247*).

The temperature of the soil, D. T. MacDougal (*Jour. New York Bot. Gard., 3 (1902), No. 31, pp. 125–131, figs. 3*).—A description is given of a thermograph devised by Prof. W. Hallock, of Columbia University, for making a continuous record of the temperature of the soil at any desired depth. "The essential features of the Hallock thermograph are as follows: The thermal element of the instrument consists of a copper bulb or globe 11 cm. in diameter, with a strengthening equatorial ridge, filled with commercial kerosene. A short section of copper tubing with a heavy wall is soldered to an opening in one pole of the globe, and the free end of the heavy tube receives a small copper tube with an external diameter of about 4 mm., a bore of 1 mm., and of any desired length. The tube is also filled with petroleum. The free end of the small tube is connected with a chamber consisting of a pair of corrugated brass disks 8 cm. in diameter, with the edges soldered together. The chamber is seated on a metal block fastened to the base of a recording apparatus and the tube connects with the chamber through an opening in the metal block. An opening is made in the upper side of the first chamber and a second chamber of the same kind is soldered to it, the interior of the two chambers being thus connected. The pair of corrugated chambers are filled with petroleum as convenient during the course of construction, and care is taken to exclude all air from the bulb, tube, and chambers. As the temperature in the bulb is made to rise it expands, and as both it and the small tube have fairly rigid walls, the total expansion of the liquid is made to press outwardly the walls of the chambers with corrugated walls, which expand and contract after the manner of a bellows. An upright post is fixed to the upper wall of the pair of chambers, and it may be lengthened or shortened in making the necessary adjustments. This post connects with a short arm 4 cm. in length, running to an axis held in bearings between two upright standards. A second arm 17 cm. long, carrying a pen, is attached to this axis and extends to an upright recording cylinder revolved by clockwork. The cylinder carries double-ruled paper and occupies a week in a single revolution. The instrument is now adjusted so that the pen bears against the point on the paper indicative of the same temperature as that of the bulb as determined by a mercurial thermometer, and it is ready for use. At the end of a week the paper, bearing a continuous tracing of the temperature for that time, is removed and another put in its place."

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[1] Analyst, 5 (1880), p. 197.

Capillary studies and filtration of clay from soil solutions, L. J. BRIGGS and M. H. LAPHAM (*U. S. Dept. Agr., Bureau of Soils Bul. 19, pp. 40, figs. 5*).—This includes studies of the influence of dissolved salts on the capillary rise of soil waters, the capillary movement of water in dry and moist soils, and filtration of suspended clay from soil solutions.

Influence of dissolved salts on the capillary rise of soil waters (pp. 5–18, figs. 3).—This is a technical paper which discusses the factors modifying capillary action, describes the methods and apparatus used in studying the effect of certain salts found in alkali (sodium chlorid, sulphate, and carbonate) on this action, and explains the significance of the results obtained. The following conclusions are drawn: "(1) Dissolved salts in general do not increase the capillary rise of soil waters. (2) Neutral salts in dilute solution have practically no influence on the extent of capillary action. (3) Concentrated or saturated solutions of all salts materially diminish capillary activity. (4) This effect appears to be due—(*a*) To the increased density of the solution, which more than offsets the increased surface tension, and—(*b*) To the resistance of a film to a tangential shearing stress, which retards capillary action and offers in addition a permanent resistance to the movement of the solution through thin films, thus increasing the angle of contact, or—(*c*) To an increase in the tension of the liquid-solid surface, as the concentration is increased. (5) Sodium carbonate differs from neutral salts, the capillary rise being considerably greater than for neutral solutions of equal concentration. (6) This may be due in part to the saponification of traces of grease on the surface of the soil grains through the hydrolysis of the sodium carbonate, thus furnishing clean surfaces for capillary action. (7) The same effect should consequently be observed with all salts which undergo an alkaline hydrolysis, viz, potassium and sodium carbonates, borates, phosphates, etc. (8) This action is characterized in the soil tubes by indistinctness of the upper boundary of the capillary column."

The capillary movement of water in dry and moist soils (pp. 19–30, fig. 1).—This is a technical account of the methods used and the results obtained in investigations on this subject. From the latter the following conclusions are drawn: "(1) The extent of capillary action in a soil under field conditions is not represented by the capillary rise of water in the air-dried soil. (2) The extent of capillary action may, however, be found by determining the limiting height through which capillary movement will take place in a moist soil. (3) If a general relation can be established between the capillary rise of water in dry and in moist soils, then the capillary rise in air-dried soils may be used as a basis for investigating the behavior of the soils under field conditions, and possesses the advantage of greater simplicity. If no definite relation can be found, then the determinations of the capillary rise in dry soils are without value. (4) It is consequently important that investigators in this line should determine the limit of capillary movement in moist soils in which they are interested, both to obtain reliable data regarding the extent of capillary action and to determine the ratio of capillary action in dry and moist soil. (5) The true limit of capillary movement may be determined by finding the limiting height of a soil column from the upper surface of which evaporation proceeds at a finite, continuous, and approximately uniform rate, the supply being obtained from a reservoir at the base of the column. The rate of evaporation may be determined directly by weighing the system, or less accurately by measuring the height of the water in the reservoir. (6) For Sea Island soil we have found the capillary rise in dry soil to be only 37 cm., while the limiting value of capillary movement in a vertical column of moist soil is not less than 165 cm., or 4.5 times as great. (7) The rate at which water can be supplied at a given point by capillary action through soil columns of various heights is of fundamental importance when the plant is dependent upon capillary movement for its water supply. This determination can readily be made by the methods described."

Filtration of suspended clay from soil solutions (pp. 31–40, fig. 1).—The difficulty of securing satisfactory filtration of solutions containing suspended clay obtained in soil analysis is pointed out, and a light, portable apparatus, consisting essentially of an unglazed porcelain filter tube connected with a filter pump, which has been devised and used with success in the Bureau of Soils, is described.

Contribution to the study of the solution of phosphoric acid in the soil solutions, G. Paturel (*Ann. Agron., 28 (1902), No. 8, pp. 385–398*).—From the results of studies of soils of different kinds, with and without the addition of superphosphates, following in the main the method proposed by Schloesing (E. S. R., 11, p. 821), the author concludes that the generally accepted view that the greater activity of superphosphate as a fertilizer is due to the fact that the phosphoric acid is widely diffused in the soil and precipitated in a fine state of division, which renders it easily assimilable by plants, is not true in all cases, especially in light, sandy soils poor in lime and having little absorptive power for the superphosphate. He found that in such soils a portion of the superphosphate added was still soluble after the lapse of several months. The results confirm those reported by Schloesing in indicating that plants take up all of their phosphoric acid in soluble form, and that the soil solutions play an important rôle in supplying this soluble phosphoric acid for the use of the plant.

On a method of determining the heat generated when soils are moistened, A. Mitscherlich (*Landw. Jahrb., 31 (1902), No. 4, pp. 577–604, figs. 5*).—In continuation of a previous article (E. S. R., 13, p. 833) the author describes a new drying apparatus for use in his method based on the heat generated on moistening soils (*Benetzungswärme*) and reports a large number of experiments on different kinds of soil to test the accuracy of the method.

Soil survey in Salt River Valley, T. H. Means (*Arizona Sta. Bul. 40, pp. 287–330, pls. 4, figs. 8, maps 3*).—A reprint from the report on field operations of the Division of Soils of this Department for 1900 (E. S. R., 13, p. 924).

Soil investigations, F. T. Shutt (*Canada Expt. Farms Rpts. 1901, pp. 140–152*).—Miscellaneous investigations are reported, including chemical analyses (total and available constituents) of 2 samples of soils from British Columbia, 2 from Ontario, 5 from Nova Scotia, and 1 from Prince Edward Island, with suggestions as to their fertilizer requirements and treatment. Examinations of several soils with reference to available lime and a study of the relation of cover crops and cultivation to soil moisture are also reported. The observed losses of water from the soil were much larger in that under crop (clover) than in that which had been cultivated.

The sampling of soils, J. W. Leather (*Jour. Chem. Soc. [London], 81 (1902), No.*

476, I, pp. 883–887).—Analyses of a number of samples of soils are reported which were made to test the accuracy of the auger method of sampling soils. The results were not conclusive.

Soil cultivation, J. H. GRISDALE (*Canada Expt. Farms Rpts. 1901, pp. 295–298*).—A brief discussion of cultivation as a means of improving the physical condition of soils.

Summer fallows, A. MACKAY (*Canada Expt. Farms Rpts. 1901, pp. 505–507*).—A brief discussion of methods of summer fallowing and of the advantages of the practice.

FERTILIZERS.

The cowpea and the velvet bean as fertilizers, J. F. DUGGAR (*Alabama College Sta. Bul. 120, pp. 123–179, figs. 3*).—"This bulletin records the results of more than 50 experiments conducted at Auburn during the past 5 years, to ascertain the effects of cowpeas and velvet beans in the improvement of the soil. The amount of soil improvement has been determined by the increase in the yields of cotton, corn, oats, wheat, and sorghum, grown as first, second, third, or fourth crops after the stubble and roots of cowpeas or velvet beans, or after vines, stubble, and roots of these plants have been plowed under. The basis for determining this increase has been the yield of each crop on plats where no leguminous plant has recently grown." Different varieties of cowpeas differ considerably in fertilizing value. In these experiments the average amount of nitrogen supplied by the whole crop was 70.2 lbs. per acre; by the stubble, roots, and fallen leaves, 19.75 lbs., or 28 per cent of the whole. Velvet beans and cowpeas were of about equal value as soil improvers. The percentage increase of the following crops when the vines were plowed under averaged 63 per cent in case of cotton and 87 per cent in case of sorghum.

"When the vines of the cowpea or velvet bean were utilized as hay and only the roots and stubble employed as fertilizer, the increase in the yield per acre of the crop immediately succeeding the stubble was as follows:" Cotton, 18 per cent; corn, 32 per cent; oats, 334 per cent; wheat, 215 per cent; sorghum hay, 57 per cent. "The largest percentage increase from either the vines or stubble of cowpeas or velvet beans was made by wheat and fall-sown oats, probably because these best prevented the washing away or leaching out of the fertilizing material in the stubble or vines of the legumes. . . . The value of the increased product resulting from the use of the entire legume for fertilizer was greater with cotton and sorghum than with corn, oats, or wheat. . . . Comparing the fertilizing effect of the vines with that of the stubble of the cowpea and the velvet bean, the excess in the next crop in favor of the vines averaged as follows:" Corn, 49 per cent; sorghum hay, 9 per cent; cotton, 40 per cent.

"With oats and wheat the vines of these summer legumes were not superior to the stubble when the small grains were sown immediately after the legumes matured.

"The fertilizing effect of the stubble of cowpeas or velvet beans was very transitory on sandy land, the average increase in the second crop of corn after the stubble being only 1.34 bushels per acre, or 12 per cent, as compared with the yield of a plat that had not borne legumes.

"The fertilizing effect of the vines of cowpeas and velvet beans was less transitory than that of the stubble, and the increase was 24 to 54 per cent in the second crop, 14 per cent in the third crop (oats), and the favorable effect was even perceptible in the fourth crop (sorghum) grown in the same year as the third. . . .

"On the other hand, on very light soil the fertilizing effects of both stubble and vines had practically disappeared within 12 months after the plowing in of the legumes."

Fertilizer experiments on moor soils, results of experiments by the

Swedish Moor-Culture Association, 1887-1899, H. von Feilitzen (*Jour. Landw., 50 (1902), No. 1, pp. 77–90, pls. 3; Deut. Landw. Presse, 29 (1902), Nos. 48, p. 413, figs. 2; 49, pp. 420, 421, fig. 1*).—A summary of the results of the experiments carried out by C. von Feilitzen, former director of the Swedish Moor-Culture Association, which have been published in book form. The Swedish moor soils are as a rule poor in potash, and thus it was found that both the yield and quality of crop was improved by applications of potash fertilizers. The soils are also poor in phosphoric acid and are benefited by applications of phosphates. The crude phosphates were of little benefit, but those containing citrate-soluble and water-soluble phosphoric acid were of equal value. The phosphates shortened the period of growth. Soluble nitrogenous fertilizers were decidedly beneficial, but lengthened the period of growth. Manure gave good results, but this is attributed to the soluble nitrogen present or to the fermentation set up by the manure in the soil, which makes the nitrogen present more available.

Pot experiments on the action of lime and magnesia in burnt lime and marl, R. Ulbricht (*Landw. Vers. Stat., 57 (1902), No. 1–2, pp. 103–166*).—This is a detailed account of pot experiments with barley supplementing experiments previously reported (E. S. R., 11, p. 1023). As in the previous experiments referred to, the lime fertilizers in all amounts used as a rule increased the yield to a marked extent. The weight of grain, however, was in every case reduced by applications of lime and marl in February. The tillering of the grain was invariably increased by the use of lime and magnesia fertilizers. Heavy applications of lime with small magnesia content promoted all phases of growth, but of straw more than of grain. In this case also the weight of the grain was lighter. Heavy applications of magnesia lime reduced yield of grain and straw.

On the dependence of the maximum yield on a definite quantitative relation between lime and magnesia in soils, O. Loew (*Landw. Jahrb., 31 (1902), No. 4, pp. 561–576*).—A discussion of this subject based mainly upon the results of investigations by the author and D. W. May (E. S. R., 13, p. 630) and T. Furuta and K. Aso (E. S. R., 14, p. 14), which show a definite relation between the amounts of lime and magnesia and the maximum growth of plants.

On the fertilizing value of peat ashes, J. Boes (*Ztschr. Oeffentl. Chem., 8 (1902), pp. 150, 151*).—This article discusses briefly the variation in the chemical composition of such ashes.

Nitrate of soda, potassium perchlorate, and crops, L. Grandeau (*Jour. Agr. Prat., n. ser., 4 (1902), No. 34, pp. 242–244*).—This is a review of various investigations on this subject from which the following conclusions are drawn: Nitrates contain an element (potassium perchlorate) which has until recently been ignored. This perchlorate is very unequally distributed in the nitrate and is very variable in amount. High percentage nitrates as a rule contain only small amounts of perchlorate.

A new use for potash salts in agriculture, F. Lucke (*Chem. Ztg., 26 (1902), No. 50, Repert., p. 175*).—A brief note on a new manure preservative known as Utilit, a by-product of the potash industry, which contains free sulphuric and phosphoric acids and various combinations of potash.

Investigations on the influence of soil moisture on the action of phosphoric acid in bone meal, Thomas slag, and superphosphate, C. von Seelhorst (*Jour. Landw., 50 (1902), No. 2, pp. 167–174*).—The results of pot experiments which are reported show that the moisture content of the soil was without effect on the action of the phosphoric acid of bone meal. On the other hand, the action of the phosphoric acid of Thomas slag and superphosphate was influenced to a considerable extent by the water content of the soil, being favored by an increased water content.

The comparative value of different phosphates, D. Prianishnikov (*Ann. Agron., 28 (1902), No. 7, pp. 356–367*).—A translation of an article already noted (E. S. R., 13, p. 934).

Phosphate discovery in New Zealand (*Amer. Fert., 17 (1902), No. 3, pp. 15, 16, figs. 5*).

Bureau of fertilizers, R. E. Rose et al. (*Florida Dept. Agr. Mo. Bul., 12 (1902), No. 77, pp. 11–24*).—The results of fertilizer inspection during the season of 1901–2 are reported, with suggestions to purchasers, and notes on certain special fertilizing materials.

Report on official inspection of commercial fertilizers and agricultural chemicals during the season of 1901, C. A. Goessmann (*Massachusetts Sta. Rpt. 1901, pp. 91–103*).—This report includes a comparison of the quality of the fertilizers examined during 1900 and 1901, the trade values of fertilizing materials during the same years with an explanation of the use of these data in calculating the approximate value of a fertilizer, a table showing the average composition of fertilizers examined during 1901, and a list of brands of fertilizers licensed for sale under the provisions of the State law during the year.

Compilation of analyses of agricultural chemicals, refuse salts, ashes, lime compounds, refuse substances, guanos, phosphates, and animal excrements, H. D. Haskins (*Massachusetts Sta. Rpt. 1901, pp. 108–131*).—This compilation includes the maxima, minima, and averages of all analyses made at the Massachusetts Agricultural College and Experiment Station during the period from 1868 to 1901. The data are given in percentages and pounds per ton.

Inspection of fertilizers in 1901, F. W. Morse (*New Hampshire Sta. Bul. 88, pp. 11*).—Analyses of 106 samples of fertilizers collected under the supervision of the secretary of the State board of agriculture are reported, together with analyses of wood ashes and miscellaneous fertilizing materials, including fish scrap, glue "stick," ground bone, tankage, and nitrate of potash.

Analysis of commercial fertilizers (*South Carolina Sta. Bul. 70, pp. 24*).—This bulletin reports analyses and valuations of 186 samples of fertilizers collected during the season of 1901–2, accompanied by notes on the nature and sources of phosphoric acid, nitrogen, and potash used in fertilizers and on valuation, and the laws and regulations governing the sale of commercial fertilizers in the State.

Fertilizers, F. T. Shutt (*Canada Expt. Farms Rpts. 1901, pp. 152–160*).—Analyses are reported of miscellaneous materials, including muck, mud, marl, limestone, Thomas slag, wood ashes, tannery waste, and seaweeds (rockweed and eelgrass).

FIELD CROPS.

Field experiments with farm crops, W. Saunders, W. T. Macoun, F. T. Shutt, J. H. Grisdale, R. Robertson, W. S. Blair, S. A. Bedford, A. Mackay, and T. A. Sharpe (*Canada Expt. Farms Rpts. 1901, pp. 7–58, 113–120, 125–127, 167–183, 298–311, 337–356, 391, 392, 395–421, 457–482, 516–533*).—This is the annual report for 1901 of the Central Experimental Farm for Canada and Ottawa and the branch farms for the Maritime Provinces, Manitoba, the Northwest Territories, and British Columbia. The results of variety tests with the different crops in 1901, excepting winter wheat, have been noted from a previous bulletin (E. S. R., 13, p. 838).

Wheat.—Of 22 varieties of winter wheat tested at Ottawa, Gold Coin, Dawson Golden Chaff, Early Red Clawson, Reliable, and Jones Winter Fife headed the list.

Spring wheat at the Manitoba farm yielded best when sown at the rate of 6 pks. per acre. At Ottawa the best yield was from seeding 2 to 2½ bu. per acre on sandy loam and 1 to 1½ bu. on clay loam. Mixtures of wheat and flax and wheat and rape were grown in Manitoba. A mixture of 7 pks. of wheat and 1 pk. of flax per acre yielded 21 bu. and 20 lbs., as compared with a yield of 28 bu. and 40 lbs. per acre where 7 pks. of wheat were sown alone. A mixture of 7 pks. of wheat and 2 lbs. of rape per acre produced 25 bu. and 40 lbs., while the wheat sown without the rape gave a yield of 28 bu. and 40 lbs. The yields of wheat on summer fallow and unplowed stubble land were practically the same. In a fertilizer test the best results were obtained from an application of 200 lbs. of nitrate of soda per acre, one-half being applied when the grain was 2 in. high and the rest when it was 6 in. high. The results from selected and unselected seed varied greatly among the different varieties, but on an average the unselected seed produced 9 lbs. more per acre than the selected seed.

At the Northwest Territories farm Preston produced the largest yield. Here a comparative test of selected (hand-picked), well-cleaned, and small seed resulted in favor of the well-cleaned seed. In a fertilizer test the best yields were obtained from 200 lbs. of muriate of potash per acre on 1 plat and the use of 200 lbs. of superphosphate, 100 lbs. of muriate of potash, and 100 lbs. of nitrate of soda on another. Both plats yielded at the rate of 65 bu. and 20 lbs. per acre. The results from different methods of soil preparation showed that wheat grown in a rotation test produced the heaviest yield.

At the British Columbia farm sowing 2½ and 3 bu. of seed per acre produced the most grain, but it was found that thick sowing weakened the straw and shortened the heads. In this experiment the grain on the thickly sown plats lodged.

Oats.—In a field test of a number of varieties on the Manitoba and Northwest Territories farms Abundance headed the list in yield. At the latter place selected, well-cleaned, and small seed yielded 130 bu. and 20 lbs., 122 bu. and 12 lbs., and 120 bu. and 20 lbs. per acre, respectively. In general, better yields were obtained on fallow than on prairie sod turned back with the plow. In the fertilizer test at the British Columbia farm an application of 200 lbs. of superphosphate and 100 lbs. each of muriate of potash and nitrate of soda per acre produced the heaviest yield. The use of 3 bu. of seed per acre proved most economical. At Ottawa sowing at the rate of 2 to 3 bu. per acre gave the largest crops on either sandy or clay loam soils.

Barley.—The yield from selected seed on the Manitoba farm was 1 bu. and 32 lbs. per acre more than the yield from unselected seed. The variety Beaver stood first, with a yield of 55 bu. and 15 lbs. per acre. In British Columbia the results from using different quantities of seed were in favor of sowing 3 bu. per acre. At Ottawa 2½ to 3½ bu. of seed per acre gave the best yields on either sandy or clay loam soils.

Peas.—At the Manitoba farm a mixture of 2 bu. of peas and 2 pks. of oats per acre yielded 57 bu. and 20 lbs., as compared with 46 bu. and 20 lbs. from a mixture of 2 bu. of peas and 1 pk. of oats. In sowing peas alone 2 and 2½ bu. of seed per acre gave a yield of 33 bu. and 40 lbs., and 3 bu. of seed a yield of 32 bu. and 20 lbs. At the British Columbia farm yields ranging from 90 bu. and 40 lbs. to 106 bu. and 20 lbs. per acre were obtained on soil which had received 200 lbs. of nitrate of soda the year before.

Corn.—The results of an experiment in drilling corn in rows 21, 28, 35, and 42 in. apart in the Maritime Provinces were in favor of the 28-in. rows, while in Manitoba, the Northwest Territories, and British Columbia the 21-in. rows gave the heaviest average crops. Special fertilizer experiments in Maritime Provinces resulted in the best returns from 20 tons of green manure, the yield being 22½ tons per acre, and the next best from applications of 30 tons of manure, and of 15 tons of manure with 250 lbs. of commercial fertilizers, the yield being 18½ tons per acre in each case.

Roots.—At Ottawa turnips, mangels, carrots, and sugar beets were sown on May 8 and 22 and harvested on October 14 and 28. For turnips and mangels the advantage was with the earlier sowing and the later harvesting. The results obtained with carrots and sugar beets show that early sowing increased the crop, but the late harvesting gave a smaller yield than the early harvesting. In the Maritime Provinces 15 tons of manure and 250 lbs. of commercial fertilizers per acre gave the best yield. Manure was much more effective on the root crops than commercial fertilizers.

Analyses of sugar beets from the Northwest Territories, Manitoba, and Prince Edward Island are reported, samples from the Northwest Territories indicating an excellent quality.

Potatoes.—At Ottawa the best average results were obtained by planting the sets 14 in. apart in the row, as compared with 10, 16, and 18 in., the average results at 12 in. being nearly as good. Planting 1 in. deep gave the best results, but a depth of 4 in. is recommended to prevent the sets being disturbed by cultivation. Planting on May 30 gave better yields for both early and late varieties than later planting, and the average yields for 4 successive years are also in favor of planting the latter part of May. Spraying with Bordeaux mixture for the prevention of blight and rot proved profitable. Special experiments with fertilizers in the Maritime Provinces showed that manure increased the yield of potatoes to a larger extent than other fertilizers. A test of 8 early varieties is also reported from this farm.

Millets.—At Ottawa Cat-tail, Pearl, White Round Extra French, and Moha Hungarian, in the order named, produced the heaviest crops among 9 varieties, the yields of hay ranging from 5 tons and 240 lbs. to 8 tons and 1,280 lbs. per acre. On the Manitoba farm Japanese millet yielded 3 tons and 1,400 lbs. and Common 2 tons and 1,760 lbs. of hay per acre; and in the Northwest Territories Italian, Cat-tail, Hungarian, and Japanese gave better yields than White Round Extra French, German, or Pearl.

Soy beans—Horse beans.—These crops at Ottawa produced the best yield in the 28-in. rows, while in the Northwest Territories the yield of soy beans was in favor of the 21-in. rows, and of horse beans the 35-in. rows.

Tobacco.—Plat tests of 46 varieties were made at Ottawa. Of 6 varieties grown on large areas, Connecticut Seed Leaf gave the largest yield, 2,192 lbs. of dry leaves per acre.

Buckwheat.—Of 5 varieties tested in the Maritime Provinces, Silver Hull yielded the most grain and straw, and in a field test produced 84 bu. on 5 acres. At the Manitoba farm volunteer crops of Japanese, Silver Hull, and Gray produced over 28, 32, and 35 bu. per acre, respectively.

Flax.—Growing flax and wheat in a mixture has been mentioned above under wheat. Sowing 40 lbs. of flax per acre in Manitoba gave the best total yield, as compared with sowing 30 or 20 lbs. per acre. In the Northwest Territories flax was sown at the rate of 40 and 80 lbs. per acre on May 15, 22, and 29. For the earliest date the yield of seed was in favor of the lighter seeding, but for the other dates the yield was in favor of the heavier seeding. The difference in yield varied from 1 bu. and 26 lbs. to 2 bu. per acre. White flax was tested, but the straw did not grow over 6 in. high, and very little seed formed, although the season was very favorable for ordinary flax.

Spelt.—This grain was compared with wheat, oats, and barley in Manitoba, the yield of grain being largely in its favor. The heaviest crop was obtained from drilling at the rate of 1¾ bu. per acre, the yield being 46 bu. Summer fallow produced a larger crop of spelt than unplowed stubble land. In the Northwest Territories a yield of 58 bu. and 20 lbs. per acre was obtained.

Sunflowers.—One and one-half tons of heads per acre were obtained from Mammoth Russian sunflowers at the Manitoba farm, while in the Northwest Territories this variety sown May 22 was frozen September 17 and did not mature.

Rape.—The results of growing rape and wheat in a mixture have been given above under wheat. In the Northwest Territories Dwarf Essex, Broad Leafed, and Dwarf Victoria yielded over 41, 41, and 31 tons per acre, respectively. In British Columbia Dwarf Essex was a failure.

Miscellaneous.—A number of experiments in addition to those already mentioned are reported by the Central farm. In a test with mixed roots and mixed roots and vegetables the largest yield was obtained from a mixture of mangels, carrots, and turnips, and the smallest yield from a mixture of carrots, cabbages, and tomatoes. A report on the influence of previous crops on growing grain shows that oats and barley gave the best yield after horse beans, as compared with flax, grain, and soy beans. Clover as a green manure for oats increased the yield of grain nearly 10 per cent and the yield of straw over 35 per cent. In the case of corn the clover plats gave an increase of 40 per cent in yield of green fodder, and with potatoes the increase in yield was more than 8 per cent. Among different applications of fertilizers, 400 lbs. of Thomas slag per acre was most effective on clover and also produced the largest yield of hay from awnless brome grass. Special fertilizer experiments have been in progress at Ottawa for 12 years with 21 different applications, including barnyard manure and commercial fertilizers. The crops grown in this connection are wheat, oats, barley, corn, mangels, and turnips. The results for the season and the average results for the entire period are shown in tables. It was found in these experiments that fresh barnyard manure has an equal crop-producing power to rotted manure. It has been shown that fresh manure loses about 60 per cent of its weight while rotting. These experiments further indicate that untreated mineral phosphate and sulphate of iron are of no value as fertilizers. Common salt proved a valuable fertilizer for barley, but was much less effective when applied to spring wheat and oats. Gypsum was of some value as a fertilizer for barley but of very little service for wheat or oats.

The yields of clover and alfalfa from 2 and 4 cuttings were compared, and the composition of the different cuttings determined. Four cuttings of clover produced 258 lbs. of dry matter or 104 lbs. of crude protein more per acre than 2 cuttings. The difference in weight of crop per acre was 2,065 lbs. In the case of alfalfa 4 cuttings produced 61 lbs. more of crude protein per acre than 2 cuttings, but the weight of dry matter per acre was in favor of 2 cuttings by 48 lbs. The difference in weight of crop per acre was 1,210 lbs. in favor of 4 cuttings.

Analyses of clover, clover silage, corn, and corn silage are given, the silage being taken from different parts of the silo. The results with clover "point to a greater degree of fermentation and consequently greater loss of feeding elements in the center than at the bottom of the silo. Weight for weight, this silage is not of an equal feeding value with clover."

In rotation experiments in Manitoba now in progress for 3 years, it was found that annual leguminous crops were a more effective green manure than red clover.

The itemized cost of growing oats, barley, peas, clover hay, corn, mangels, turnips, carrots, sugar beets, rape, and pumpkins, and of making clover silage is reported.

Cooperative experiments in agriculture (*Ontario Agr. and Expt. Union Rpt. 1901, pp. 9–24*).—This report on the cooperative experimental work of the Agricultural and Experimental Union of Ontario was presented at the twenty-third annual meeting of the organization. The results with grain, root, and forage crops for 1901 are shown in brief tabular statements, and the results for several years for each particular crop are briefly considered. In addition to the report a discussion on the work of the members is given. The varieties giving the best yields in 1901 were Siberian oats, Mansbury barley, Black Hulless barley, Goose wheat, Japanese buckwheat, Early Britain peas, Early Yellow soy bean, North Star Yellow Dent corn, and Dawson Golden Chaff winter wheat.

Report of the agriculturists, W. P. Brooks and H. M. Thomson (*Massachusetts Sta. Rpt. 1901, pp. 11–56*).—This report presents the results for 1901 of fertilizer, soil, and variety tests, with different field and garden crops, in progress for a series of years. (E. S. R., 13, p. 332).

In the comparison of barnyard manure, nitrate of soda, dried blood, and sulphate of ammonia as sources of nitrogen, soy beans were grown in 1901, the yields obtained ranking the different fertilizers in the order mentioned. The average results since 1890, with a variety of crops, place them in the following order: Nitrate of soda, barnyard manure, sulphate of ammonia, and dried blood.

Common red clover, Mammoth red clover, alsike clover, and cabbage were grown this season in the muriate and high-grade sulphate of potash tests. The best yields of hay were with the sulphate, and the average results for several years also favor the use of this form for clovers. The difference in its favor appeared to be greater in proportion as the rainfall was abundant. The yield of cabbage was 33,680 lbs. per acre on the muriate plats and 30,600 lbs. on the sulphate plats.

The results with garden crops were similar to the average results of previous years. Regarding the effectiveness of nitrate of soda as 100 per cent, dried blood and sulphate of ammonia stood at 92.7 and 54.8 per cent, respectively, for the early crops (including onions, lettuce, beets, peas, and strawberries), and at 98.7 and 77.5 per cent, respectively, for the late crops (including cabbage, turnips, and celery). A comparison of muriate and sulphate of potash for these crops was in favor of the sulphate for the early and the muriate for the late crops.

The different phosphates applied on the basis of equal cost ranked in relative value as follows: Phosphatic slag, South Carolina rock, Mona guano, dissolved boneblack, Florida rock phosphate. Oats were grown in connection with this test in 1901.

In the test of different phosphates used on the basis of equal quantities of "actual" phosphoric acid, continued for several years, the results in 1901 with onions showed them to rank in the following order: Raw bone, phosphatic slag, South Carolina rock, apatite, dissolved bone meal, dissolved boneblack, Tennessee phosphate, acid phosphate, steamed bone meal, Florida phosphate. The results confirmed the conclusions of the previous year.

Different potash salts were compared as fertilizers for wheat and corn, but the results were inconclusive. The authors call attention to the proportionately large yields obtained from the use of muriate and nitrate of potash. Good yields were obtained from the use of carbonate and silicate of potash, which is considered as indicating a high grade of availability for these forms.

The aggregate yields per acre of the varieties of silage corn grown in the test with potash salts were as follows: Eureka, 47,960 lbs.; Boston Market, 38,200 lbs.; Leaming Field, 34,520 lbs., and Rural Thoroughbred, 36,150 lbs. The characters of the different varieties are briefly noted. In actual food value ensilage from Leaming Field was superior. The disadvantages of growing excessively late varieties of ensilage corn are enumerated.

Soil tests were continued this year with grass and onions. In the tests with grass nitrate of soda alone gave a considerable increase in crop, but much the best yield was obtained where it was applied with potash and dissolved boneblack. The results also show a close dependence of clover upon a liberal supply of potash, and establish the possibility of growing profitable hay crops with the use of fertilizers only. It is further concluded that for grass mixtures containing clover a combination of potash and an available phosphate is a profitable application. The results of the tests with onions were exactly similar in kind to those of the previous year, but the yield on the limed soil showed a falling off. The need of lime was shown where muriate of potash and nitrate of soda were applied and where muriate of potash was used alone. Dissolved boneblack contains a considerable proportion of land plaster, and where this substance was used the need of lime was not so apparent. As in the previous year, the use of dissolved boneblack greatly promoted the perfect ripening of the crop, and the use of either this or acid phosphate is recommended for soils on which onions failed to ripen properly. Potash in combination with lime gave a much better crop than either of the other fertilizers alone under similar conditions.

Experiments have been in progress since 1890 to illustrate the relative value of applying manure alone and with potash. Where manure alone was used, 6 cords per acre were applied, and where used in conjunction with potash, the application consisted of 4 cords of manure and 160 lbs. of potash per acre. This season these applications produced corn crops practically equal in value, while the hay crops were slightly larger on the manured plats, but the increase, as compared with the manure and potash plat, was produced at a cost greater than its value. The plats on which a special corn fertilizer is compared with an application richer in potash were in grass during the last season. Considering the results obtained up to date, "it is anticipated that the superiority of the mixture of fertilizers containing the larger quantity of potash will become more evident from year to year."

The experiment in manuring grass lands in rotation with wood ashes, ground bone and muriate of potash, and barnyard manure was continued upon the same basis as in the previous year. The yields for the season ranged from about 3¼ to 3¾ tons of hay per acre. These yields, as well as the average yields for the entire series of years, were decidedly profitable.

An application of 150 lbs. of nitrate of soda per acre on Kentucky blue grass and timothy sod increased the yield of rowen 571 and 259 lbs. per acre, respectively. The cost of increase was ½ ct. per pound for the Kentucky blue grass and 1⅙ cts. per pound for the timothy. These results showed a profit only in the case of the Kentucky blue grass.

The experiment in hauling barnyard manure and spreading it in autumn or winter, and in hauling it at that time into large piles to be scattered immediately before plowing in the spring was continued, and the results indicated that on lands sloping moderately, the spring application is preferable.

Culture tests with alfalfa are reported. The yields were small and the authors believe its success doubtful on the average soils of the State.

Maud Wonder forage crop and Brazilian millet appeared identical in every way with Pearl millet.

Stock ranges of northwestern California, J. B. DAVY (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 12, pp. 81, pls. 8, figs. 4, maps 3*).—This bulletin contains an account of northwestern California, its physiography and climate, and especially its forage conditions. For the purpose of discussion the region is divided into the interior plateau region, the coast bluff belt, and the redwood belt, and each division is treated separately.

Brief discussions are given on the temperature, water supply, soils, and agricultural products of the interior plateau region, including the mountain valleys and upland ranges, the open summer or annual ranges, the prairies, the woodland or winter range, the chaparral, and subalpine meadows. The forage plants occurring under these different conditions are enumerated and their value noted. The prevalent weeds occurring throughout the region are also discussed. About 50 years ago, when the Sherwood Valley was first settled, *Danthonia californica* was the favorite, most nutritious, and most abundant forage plant. At present it is scarce. *Bromus racemosus commutatus*, *B. hordeaceus glabrescens*, and *Holcus lanatus* have become naturalized and prevail in place of the former native plants. Other naturalized species, but less common than those mentioned, are soft chess (*Bromus hordeaceus*), silvery hair grass (*Aira caryophyllea*), small barley grass (*Hordeum maritimum gussoneanum*), and rat-tail fescue (*Festuca myuros ciliata* and *F. myuros sciuroides*). Broncho grass (*Bromus maximus gussoni*), which is occasionally found, is considered of no value and as being a troublesome weed. Redtop (*Agrostis alba*) and timothy (*Phleum pratense*), introduced as forage plants, have almost entirely disappeared from the wild meadows and pastures of the mountain valleys. The native grasses found in the meadows are tufted hair grass (*Deschampsia cæspitosa*), slender hair grass (*D. elongata*), agrostis (*A. exarata microphylla*), meadow barley grass (*Hordeum nodosum*), danthonia (*Danthonia californica*), prairie June grass (*Kœleria cristata*), and California fescue (*Festuca californica*). Blue canary grass (*Phalaris amethystina*) is found along the edge of the redwood forests, and a species of Pleuropogon, *Panicularia fluitans*, and slough grass (*Beckmannia erucæformis*) are found in the streams and swamps. Of the native clovers, *Trifolium dichotomum*, *T. microdon*, *T. barbigerum*, *T. bifidum decipiens*, *T. microcephalum*, *T. wormskjoldii*, *T. variegatum*, and *T. tridentatum* are quite common, while *T. depauperatum* and *T. longipes* occur only sparingly.

Bull clover (*T. wormskjoldii*), the most valuable among them as a forage plant, is also used as food by the Indians.

In the Sherwood Valley about 3 tons of hay per acre is considered an average yield, and it is estimated that about 50 head of cattle can usually be pastured for about 5 months on 100 acres of valley pasture. In the recommendations for the improvement of pasture and meadow the author mentions the following species as most likely to be successful: Orchard grass (*Dactylis glomerata*), reed fescue (*Festuca arundinacea*), many-flowered millet grass (*Oryzopsis miliacea*), tall oat grass (*Arrhenatherum elatius*), awnless brome grass (*Bromus inermis*), red fescue (*Festuca rubra*), rescue grass (*Bromus willdenowii*), timothy (*Phleum pratense*), meadow foxtail (*Alopecurus pratensis*), creeping bent or florin (*Agrostis alba stolonifera*), Italian ray grass (*Lolium italicum*), red clover (*Trifolium pratense*), perennial white clover (*T. repens*), and alsike clover (*T. hybridum*).

On the open summer or annual ranges which occupy the slopes and summits of the plateau ridges and mountains, rat-tail fescue, small barley grass, and soft chess were found prevalent. In addition to these grasses alfilerilla and wild clovers chiefly compose the range feed. The only perennial grasses found on dry open hillsides were Lemmon bunch grass (*Stipa lemmoni*), California melic grass (*Melica californica*), a variety of red fescue (*Festuca rubra*), a variety of sheep fescue (*F. ovina*), danthonia (*Danthonia californica*), *Sitanion villosum*, *Elymus angustifolius*, and one or two species of Poa. In describing the woodland or winter range the prevalent trees, underbrush, and herbaceous plants are enumerated, and orchard grass, tall oat grass, wood meadow grass (*Poa nemoralis*), and reed fescue (*Festuca arundinacea*) are recommended for trial. In the chaparral or low thickets covering dry, stony ground *Melica californica*, *M. harfordii*, *Stipa lemmoni*, *Sitanion multisetum*, *S. planifolium*, *Elymus glaucus*, *Bromus carinatus*, and species of Poa and Festuca are the most common. The forage plants other than grasses occurring in these places are *Lotus americanus* and *Ceanothus integerrimus*. Judging from the plants growing in protected places the author concludes that the primitive forage plants were the bunch grasses comprising Danthonias, Stipas, Melicas, Poas, and perennial Festucas, with annual and perennial clovers, wild pea vines, and wild sunflowers.

The discussion of the coast bluff belt treats of the mesa lands, white-ash prairies, bottom lands, and sand dunes separately, and mentions the most important species of plants represented in the flora of each region. The subject of sand-binding plants is discussed at some length.

In the redwood belt the grasses are reported as scarce and the few common species are *Bromus læripes*, *Melica bromoides*, *Savastana macrophylla*, *Trisetum canescens*, and *Deschampsia elongata*.

In addition to notes on poisonous plants and fungus parasites, the following fodder crops cultivated in northwestern California are described: Beach grass (*Ammophila arenaria*), bur clover (*Medicago denticulata*), black medic (*M. lupulina*), blue grama (*Bouteloua oligostachya*), buffalo grass (*Bulbilis dactyloides*), California lotus or Dakota vetch (*Lotus americanus* or *Hosackia purshiana*), creeping bent (*Agrostis alba stolonifera*), diss (*Ampelodesmos tenax*), field peas (*Pisum arvense*), hard fescue (*Festuca duriuscula*), Johnson grass (*Andropogon sorghum halepensis*), hairy vetch (*Vicia villosa*), knot grass (*Paspalum distichum*), meadow foxtail (*Alopecurus pratensis*), orchard grass (*Dactylis glomerata*), ray grass (*Lolium* spp.), Italian ray grass (*L. italicum*), English perennial ray grass (*L. perenne*), Australian ray grass (*L. perenne tenue*), many-flowered ray grass (*L. multiflorum*), red clover (*Trifolium pratense*), red fescue (*Festuca rubra*), redtop (*Agrostis alba*), reed fescue (*Festuca arundinacea*), sheep fescue (*F. ovina*), awnless brome grass (*Bromus inermis*), tall oat grass (*Arrhenatherum elatius*), timothy (*Phleum pratense*), vetch (*Vicia sativa*), and white clover (*Trifolium repens*).

Forage conditions on the northern border of the Great Basin, D. GRIFFITHS

(*U. S. Dept. Agr., Bureau of Plant Industry Bul. 15, pp. 60, pls. 16, map 1*).—This bulletin is a report upon investigations made in 1901 in the region between Winnemucca, Nev., and Ontario, Oreg. A description of the region is given and the precipitation for 1900 and 1901 recorded. The soils of the section are briefly discussed and 50 soil samples taken at different places are described. Partial analyses of these soil samples furnished by the Bureau of Soils of this Department are tabulated.

Grease wood (*Sarcobatus vermiculatus*) and alkali saccaton (*Sporobolus airoides*) were found growing on soils containing 4 and 4½ per cent of soluble white alkali, and salt grass (*Distichlis spicata*) on soils with 3 per cent of soluble black alkali. Utah saltbush (*Atriplex truncata*), small cord grass (*Spartina gracilis*), alkali grass (*Puccinellia airoides*), and prairie bulrush (*Scirpus campestris*) grew on land containing from 0.50 to 0.70 per cent of black alkali. The growth of black sage (*Artemisia tridentata*) is considered an indication of good soil.

The method of handling stock on the ranges of that region and the condition of the ranges are discussed at some length. The species of grasses considered as furnishing the largest quantity of feed are Buckley blue grass (*Poa buckleyiana*), Wheeler blue grass (*P. wheeleri*), and bunch wheat grass (*Agropyron spicatum*). Black sage, grease wood, spiny saltbush (*Atriplex confertifolia*), and hop sage (*Grayia spinosa*) are not eaten enough by stock to be injured by overstocking, but red sage (*Kochia americana*), bud sage (*Artemisia spinescens*), and white sage (*Eurotia lanata*) suffer considerably from this cause. It was noticed how overstocking injures the open grassy areas by exposing the roots of the grasses to the sun and by facilitating the loss of moisture from the unprotected soil. Several areas of pure sheep fescue (*Festuca ovina*) from 3 to 60 acres in extent were found completely ruined, and the author concludes from his observations that the process of recuperation will be exceedingly slow. It was observed that cinquefoil (*Dasiphora fruticosa*), willows, poplar (*Populus tremuloides*), wild choke cherry (*Prunus emarginatus*), and Indian currant (*Symphoricarpos oreophilus*) furnish an important part of the forage supply.

The hay crops of the region are discussed and the methods of handling hay on a large scale are described. The grasses considered the best native hay crops of the region are wild wheat or blue stem (*Elymus triticoides*) and bunch blue grass (*Poa lævigata*). The following forage plants were common on some of the hay land areas: Sedges (*Carex lanuginosa*, *C. douglasii*, and *C. nebraskensis*), salt grass (*Distichlis spicata*), redtop (*Agrostis alba*), alkali saccaton (*Sporobolus airoides*), squirrel tail (*Hordeum jubatum*), wild barley (*Hordeum nodosum*), orchard barley (*Sitanion longifolium*), wild wheat (*Elymus triticoides*), giant rye grass (*E. condensatus*), slender wheat grass (*Agropyron tenerum*), bunch blue grass (*Poa lævigata*), steel grass (*Sporobolus depauperatus*), slough grass (*Beckmannia erucæformis*), beard grass (*Polypogon monspeliensis*), creeping spike-rush (*Eleocharis palustris*), rush (*Juncus balticus*), prairie bulrush (*Scirpus campestris*), tule (*S. lacustris*), clover (*Trifolium involucratum*), seaside arrow grass (*Triglochin maritima*), and cat-tail (*Typha latifolia*). The successful introduction of redtop and timothy into the region is reported. *Psoralea purshii*, *Dalea kingii*, *Tetradymia comosa*, and moss are briefly considered for their value as sand-binding plants.

Lists of the more common weeds and the more important native forage plants, together with brief descriptions of their habits and distribution, are given. The poisoning of stock due to eating larkspur and wild parsnip is also noted.

Experiments in range improvement in central Texas, H. L. BENTLEY (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 13, pp. 72, pls. 2, figs. 6*).—The work and results of experimental range improvement in central Texas, carried on for 3 successive years, are reported at some length. The history of each year's work is reviewed separately. The experiments were conducted on a section of land divided into a number of portions, each portion receiving a different treatment. Plat tests with grasses and forage crops were made in a grass garden in connection with this work.

From the first year's work it was concluded that cultivating pastures with disk and iron-tooth harrows, especially in the semiarid regions of the State, was profitable, and that pastures in that region should be rested during the seasons when the grass seeds mature and fall to the ground. These conclusions were confirmed by later results.

The outcome of the second year's work demonstrated the availability of alfalfa, sulla, sainfoin, vetches, several varieties of cowpeas, velvet bean, soy bean, teosinte, and several varieties of sorghum for annual or temporary pastures and for hay purposes. The results further showed that the seeds of grama and mesquite grasses and of wild timothy, cotton top, Canadian rye, and everlasting grass can be utilized to good advantage for permanent pasture purposes. In addition to the above results it was also definitely shown that the ranges may be improved by judicious resting of the pastures, cultivating the sod, and sowing the seeds of hardy native and improved grasses.

During the third year from 80 to 85 head of mixed cattle were pastured on the land. This was about one head to every 7½ acres, as compared with a capacity as estimated by experts of one head to every 16 acres at the time the experiments were begun. All the pastures were not grazed at the same time, as each portion of the pasture land was given periods of rest in regular succession. During these resting periods the different pastures carried double the number of stock recommended. "As one result of this systematic resting, the grasses in each pasture were, to a greater or less extent, permitted to mature seeds, which, falling to the ground, increased the number of grass roots and in that way added materially to the capacity of the range for supporting stock."

The author believes that the sustaining capacity of the range can be increased in connection with pasturing stock provided the number of cattle is never too large and each part of the range is given its regular period of rest. "It was practicable April 1, 1901, to place as many as 100 head of mixed cattle on the 640 acres included in the grass and forage plant station near Abilene, and hold them thereon during the succeeding 12 months without giving them other feed than they could get for themselves. But that could not be done with the 640 acres thrown into one pasture and the 100 head of cattle allowed during the 12 months to range at will over the entire pasture."

The cost of the range improvement work did not average 25 cents per acre per year. The author considers the outlay and the resulting increase in pasture capacity and shows the profitableness of the work.

As a result of experimental work a list of grasses and forage plants well adapted to the climatic and soil conditions of central Texas is given. Each species is briefly described and its behavior in culture tests at the station grass garden and elsewhere in that region is reported. The list includes the following: *Grasses*—barnyard grass (*Panicum crus-galli*), Bermuda grass (*Cynodon dactylon*), buffalo grass (*Bulbilis dactyloides*), bushy blue stem (*Andropogon nutans*), Colorado grass (*Panicum texanum*), cotton top grass (*P. lachnanthum*), crab grass (*P. sanguinale*), curly mesquite (*Hilaria cenchroides*), everlasting grass (*Eriochloa punctata*), grama grass (*Tripsacum dactyloides*), black grama (*Hilaria mutica*), blue grama (*Bouteloua oligostachya*), side oats grama (*B. curtipendula*), Johnson grass (*Andropogon halepensis*), knot grass (*Paspalum distichum*), little blue stem (*Andropogon scoparius* and *A. torreyanus*), the millets, needle grass (*Aristida fasciculata*), rescue grass (*Bromus unioloides*), smooth brome grass, (*Bromus inermis*), the sorghums, Texas blue grass (*Poa arachnifera*), white top grasss (*Triodia albescens*), wild rye (*Elymus canadensis*), wild timothy (*Muhlenbergia racemosa*), teosinte (*Euchlæna luxurians*), and common oats and wheat; *legumes*—alfalfa or lucern (*Medicago sativa*), Turkestan alfalfa (*M. sativa turkestanica*), oasis alfalfa, Florida beggarweed (*Desmodium tortuosum*), alsike clover (*Trifolium hybridum*), bur clover (*Medicago maculata, M. denticulata*), mammoth clover (*Trifolium medium*), red clover (*T. pratense*), Russian red clover (*T. pratense pallida*), sweet clover (*Melilotus alba*), white clover (*Trifolium repens*), cowpea (*Vigna catjang*), field pea, gram or chick pea (*Cicer arietinum*), Metcalf bean (*Phaseolus retusus*), soy bean (*Glycine hispida*), sulla (*Hedysarum coronarium*), velvet bean (*Mucuna utilis*), spring vetch (*Vicia sativa*), hairy vetch (*V. villosa*), sainfoin (*Onobrychis sativa*), and peanuts (*Arachis hypogæa*).

Rape, saltbushes, sweet potatoes, and tallow weed are reported as having given more or less satisfactory results.

Grasses and leguminous crops for the Arkansas Valley, H. H. GRIFFIN (*Colorado Sta. Bul. 68, pp. 1–11*).—Brief notes are given, with cultural directions, on a number of grasses and leguminous crops adapted to the Arkansas Valley. The plants discussed are orchard grass, tall meadow fescue, tall meadow oat grass, Kentucky blue grass, redtop, timothy, serradella, red clover, cowpea, field pea, soy bean, and hairy vetch. Notes on when to sow grass seed and on fall seeding of alfalfa are also given.

Grass seeding on irrigated land, W. JONES (*Amer. Agr. (mid. ed.), 69 (1902), No. 3, p. 82*).—A brief note on methods of sowing alfalfa, timothy, redtop, and broom grass seed on irrigated lands in Wyoming.

Awnless brome grass, J. FLETCHER (*Canada Expt. Farms Rpts. 1901, pp. 261, 262*).—The value of the awnless brome grass (*Bromus inermis*) for the more or less arid regions of the Northwest is shown, and the results of an experiment with this grass in the Calgary district are given. In this experiment 8 acres were seeded with this grass in 1897, and in 1900 the hay and seed sold from this area amounted to $413.50.

Notes on summer forage crops, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1901, pp. 169, 170*).—Brief notes are given on wheat and winter vetch, corn and cowpeas, and barnyard millet as forage crops. Earlier observations along this line were published in Bulletin 72 of the station (E. S. R., 13, p. 176).

The improvement of cereals during the last ten years, N. H. NILSSON (*K. Landt. Akad. Handl. Tidskr., 40 (1901), No. 3, pp. 149–162*).—A historical sketch of methods of seed improvement of cereals, with special reference to the work done in this line by the author at the Svalöf Seed Improvement Station at Svalöf, Sweden (E. S. R., 13, p. 814). Since 1892 the author has followed pedigree culture, i. e., selection for propagation of individual parent plants possessing especially desirable characteristics. Each year the finest and most typically and harmonically developed plant is selected from the pedigree plat for the mother plant to be grown the following year. The seed of the other plants in the pedigree plats is sown in the so-called control plats, where the variety is examined qualitatively and its cultural value determined in a preliminary manner. If the variety proves promising, it is grown in such quantities as to permit of careful comparative tests on a large scale, and if these also give good results, it is handed over to a private company for a more extended culture and its consequent disposal to farmers. In these culture tests the variety is watched closely, so that only fixed and really superior varieties are sent out. In the years that have passed since this method of seed improvement was adopted by the Svalöf station the following 17 new varieties of cereals and legumes have been bred by the station and given to the seed trade: Svalöf Top Squarehead wheat, Svalöf Grenadier wheat, Svalöf Princess barley, Svalöf Swan Neck barley, Svalöf Extra Squarehead wheat, Svalöf Black Bell oats, Svalöf Black Grand Mogul oats, Svalöf Whiting oats, Svalöf Improved Sweet vetch, Svalöf Improved Gray vetch, Svalöf White Round vetch, Svalöf Spring Pearl wheat, Svalöf "Gute" barley, Svalöf Giant Six-rowed barley, Svalöf Hannchen barley, Svalöf "Ris" wheat, and Svalöf "Bore" wheat. These are all fixed and characteristic varieties, and several of them have found general distribution among Swedish farmers and have proved as valuable as expected. In addition, several hundred new varieties bred at Svalöf are still under trial, and many of them are very promising.

The author maintains that the older, so-called methodical system of plant breeding has not and can not accomplish what has been expected of it. Selection in groups, no matter if regulated by the most exact methods, can but rarely lead to fixed characteristics, i. e., to true improvement, and never to well-characterized, wholly new varieties. The breeding of agricultural plants must be built on nature's own laws of heredity and variation, which, among other things, point to the single living plant individual as the only true unit with which we have to reckon and to work. The work of plant breeding must be planned in a scientific manner and be founded on purely botanical characteristics, which, on the one hand, constitute the most certain guides to the detection of essential and hereditary qualities in the mother plants, and, on the other hand, endow the new varieties thus bred with the dignity of independent botanical species, raised above a modifying influence of changing conditions of climate and soil. Special, well-equipped, scientific, and practical institutions are required for the advancement of agricultural plant production, which, taking the existing crops of the country or of a geographical plant zone as a basis, must breed new, improved races adapted to the needs of the different regions and different requirements. The work of maintaining the standard of these varieties by means of systematic selection falls to the farmer and the seedsman.—F. W. WOLL.

Types of green and yellow rye and dark and light colored Squarehead wheat grown under field conditions, M. FISCHER (*Fühling's Landw. Ztg., 50 (1901), Nos. 19, pp. 684–692; 20, pp. 727–734; abs. in Centbl. Agr. Chem., 31 (1902), No. 4, p. 258*).—A difference in the development of the plants from green and yellow grains of rye was plainly shown, although the seed was of a common origin. The plants resulting from the yellow grains required, in addition to an application of nitrogenous fertilizers given in the fall, a heavier application of phosphoric acid than the plants grown from the green-colored seed. The special characteristic of the plants from the green grains was their greater hardiness. In the test with breeding types of Squarehead wheat the dark-colored seed represented the hard and glassy grains, and the light-colored seed the soft and mealy wheat. The principal result from this test was that the plants from the light-colored grains showed the greatest hardiness.

Alfalfa pasture in Argentina, B. W. SNOW (*Amer. Agr. (mid. ed.), 69 (1902), No. 3, p. 82*).—A brief description of alfalfa pasture in Argentina, and a comparison of the results with pasturing on native grasses. It is stated that over 4 acres of natural pasture are required to sustain one animal, while less than 1 acre of alfalfa pasture produces the same result.

Breeding pure forms of Bohemian barley, J. NOLČ (*Deut. Landw. Presse, 29 (1902), Nos. 28, pp. 239, 240, figs. 3; 29, p. 248, figs. 2*).—This article is a detailed description of the method of originating new forms of barley as practiced in a commercial way.

Hungarian and Virginia dent corn varieties, L. KIESSLING (*Deut. Landw. Presse, 29 (1902), No. 1. p. 4*).—A comparison of these varieties shows that Hungarian dent corn is earlier than the Virginia, but not so productive.

A chemical study of the Sea Island cotton seed, F. S. SHIVER (*South Carolina Sta. Bul. 68, pp. 90, fig. 1*).—As distinguished from the Upland varieties the Sea Island cotton has a small black seed, which is almost entirely denuded of lint in the process of ginning. Two varieties of Sea Island cotton seed were studied extensively as to their composition with reference to fertilizing and food constituents, and the results compared with data for Upland and Egyptian seed. On an average the seed of the finest Sea Island cotton weighed 0.0971 gm. and that of the coarsest, 0.0966 gm. On an average the kernels constituted 59.58 per cent, and the hulls 40.42 per cent of the seed. Taking the average of three mills, the yield of oil was 42.6 gal. per ton, or 75.8 per cent of the total oil present. At 23.6° C. the refractive index of the oil examined was 1.4718, the saponification equivalent, 215. The average composition of the seed and its parts is given as follows:

Average composition (food constituents) of Sea Island cotton seed and its products.

	Water.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Cotton seed	8.05	20.96	19.71	31.44	15.31	4.53
Cotton-seed kernels	6.47	34.00	34.65	[a]16.80	2.31	5.77
Cotton-seed hulls	10.29	6.71	3.04	44.73	32.22	3.01
Cotton-seed linters	6.93	3.88	2.27	11.29	73.20	2.43
Cotton-seed lint	5.91	2.30	1.10	8.03	81.04	1.62
Cotton-seed meal	9.24	28.43	7.86	[b]33.41	15.92	5.14

[a] Containing 4.49 pentosans. [b] Containing 13.08 pentosans.

The feeding value of the seed is discussed. The averages for nitrogen and ash constituents are given in the following table:

Average composition (nitrogen and ash constituents) of Sea Island cotton seed and its products.

	Seed.	Seed kernels.	Hulls.	Linters.	Lint.	Meal.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Moisture[a]	8.050	6.470	10.290	6.930	5.91	9.240
Crude ash	4.530	5.770	3.010	2.430	1.62	5.140
Nitrogen	3.350	5.440	1.070	.620	.37	4.550
Total phosphoric acid	1.628	2.676	.387	.198	.13	1.894
Insoluble phosphoric acid	.080	.120	.050	....	....	.140
Soluble phosphoric acid	1.360	1.660	.330	....	....	1.360
Reverted phosphoric acid	.180	.900	.010	....	....	.400
Available phosphoric acid	1.540	2.560	.340	....	....	1.760
Total potash	1.615	1.734	1.346	.510	.57	1.676
Water-soluble potash	1.370	1.560	1.090	....	....	1.370
Lime	.322	.374	.239	.212	.17	.346
Magnesia	.657	.905	.331	.158	.13	.837
Insoluble matter	.037	.050	.051	.939	.14	.063

[a] In air-dry material.

The difficulty of securing all of the phosphoric acid present in Sea Island seed by ordinary treatment with nitric and hydrochloric acids indicated the presence of some organic form of phosphorus, such as glycerol-phosphoric acid or lecithin. A number of determinations of the latter substance were made, showing 0.66 per cent in the seed and 0.94 in the meal, an amount too small to influence to any appreciable extent the determination of phosphoric acid. It is concluded that part of the latter is in the form of meta and pyro phosphoric acid, as shown by Hardin to be the case in upland cotton-seed meal (E. S. R., 4, p. 901), and only a small part in the ortho form.

Hop culture in Belgium, L. BÉTHUNE (*Jour. Soc. Cent. Agr., Belg., 49 (1902), No. 4, pp. 147–167*).—An article discussing the condition of the Belgium hop industry.

Potatoes grown under straw (*Amer. Agr. (mid. ed.), 69 (1902), No. 4, p. 124*).—A brief note on how prize potatoes were grown by this method.

Report on ramie, E. DAZEY (*Bul. Agr. Algérie et Tunisie, 8 (1902), No. 1, pp. 24–32*).—This report treats of the culture of ramie in Algeria and its preparation for industrial purposes.

The rice industry of Louisiana and Texas, A. E. HEBERT (*Tradesman, 46 (1902), No. 9 (23. annual), pp. 113–115, figs. 2*).—A general account of the industry in these two States.

Pennsylvania sugar beets in 1901, W. FREAR and W. T. CARTER (*Pennsylvania Sta. Bul. 59, pp. 8*).—The composition of 31 samples of sugar beets grown in Elk County in 1901 and the yields per acre from 22 plats are reported. The average percentage of sugar in the cleaned and decrowned beets was 16 per cent and the average coefficient of purity 83.8 per cent. The average yield of topped beets on 22 plats was at the rate of 13.52 tons per acre. The weather conditions were less favorable than usual to the yield of beets, but favored a high sugar content. The manner of conducting the test and the conditions connected with it are described.

The sugar-beet industry, H. W. WILEY (*Ontario Agr. and Expt. Union Rpt. 1901, pp. 33-42, figs. 2*).—A paper on the sugar-beet industry, presented at the twenty-third annual meeting of the Ontario Agricultural and Experimental Union. A discussion of the paper is also given.

The influence of nitrogen, potash, and phosphoric acid on the sugar beet, (*Bul. Assoc. Chim. Sucr. et Distill., 19 (1902), No. 9, p. 1130*).—A summary is given of the results of experiments by Wilfarth, which lead to the conclusion that sugar beets require a complete fertilizer and that manuring with nitrogenous fertilizers alone does not give the good results generally attributed to them in practice.

Growing Sumatra tobacco under shade in the Connecticut Valley, M. WHITNEY (*U. S. Dept. Agr., Bureau of Soils Bul. 20, pp. 31, pls. 7, figs. 2*).—This bulletin contains a detailed statement of the growing of Sumatra tobacco under shade in the Connecticut Valley during the season of 1901. Preparation of the seed bed, selection of the land, erection and cost of the shade, and the cultivation and preparation of the crop are described, and suggestions as to the important points to be sought in the culture of wrapper leaf are given.

The area covered in this work aggregated 41 acres, of which 35.88 acres were Sumatra and the rest Connecticut Havana. The average total cost of the shade per acre was $286.70. The cost of fertilizers ranged from $10.51 to $64 per acre, with an average of $45.31. The cost of cultivation, including the preparation of the seed bed or the purchase of the plants where no seed bed was constructed, is estimated at between $34.21 and $73.28 per acre, with an average of $47.94. The cost of harvesting, including the priming, stringing, hanging, and taking down and tying the tobacco, is estimated at an average of $137.93 per acre. The fermentation, sizing, assorting, and baling was estimated to have cost an average of $139.29 per acre. "The total cost of the crop, including the shade, fertilizers, cultivation, harvesting [fermentation, sizing, assorting, and baling], as nearly as this could be determined from the accounts kept by the farmers and by the Department agents, varied from $613.42 to $849.55 per acre, or an average of $657.17." The total yield of Sumatra tobacco was 51,308 lbs., or an average of 1,430 lbs. of cured tobacco per acre. Of this crop about 71 per cent was wrappers, 16 per cent seconds, and 13 per cent trash. The Connecticut Havana seed grown under shade produced an average of 1,367 lbs. per acre. The cost of Sumatra tobacco, barn-cured and including the whole cost of the shade, fertilizers, cultivation, and harvesting, is estimated at a little over 36 cts. per pound, or at 32.2 cts. per pound if one-fifth of the cost of the framework is charged against the crop. "The cost of the finished product, including cost of warehouse work and allowing for the loss in this stage of the work, is estimated at 51½ cts. per pound, including the total cost of the shade, or 47.6 cts. per pound charging one-fifth only of the cost of the framework." The author assumes that the framework will last 5 years. During the summer of 1901 a portion of this crop of Sumatra tobacco was sold at an average price of $1.91 per pound, prices ranging from $1.40 to $2.50 per pound.

Tobacco culture in Haiti (*U. S. Consular Rpts., 58 (1902), No. 256, pp. 116, 117*).—A brief account of the culture of tobacco in Haiti, with notes on curing and preparing the product and its use in cigar manufacture.

The wheat industry in the Philippines (*Amer. Thresherman, 4 (1902), No. 8, pp. 623, figs. 9*).—This article treats of the native threshing and milling devices.

Variety tests with winter wheat, A. SEMPOLOVSKI (*Deut. Landw. Presse, 29 (1902), No. 31, pp. 263, 264*).—The varieties tested are briefly described and the yields of straw and grain recorded.

HORTICULTURE.

Report of the South Haven Substation for 1901, S. H. Fulton (*Michigan Sta. Bul. 194, pp. 31-72*).—This is the regular annual report on the fruits, vegetables, and nuts growing at the South Haven Substation, and is similar in character to those of previous years (E. S. R., 13, p. 349). The data for 1901 include tabulations on the yield, quality, etc., and descriptive notes in some instances, of 50 varieties of raspberries, 26 of blackberries, 18 of currants, 15 of gooseberries, 21 of cherries, 84 of peaches, 40 of pears, 12 of plums, 60 of grapes, 9 of quinces, 81 of apples, 12 of crab-apples, and several varieties of chestnuts, filberts, pecans, almonds, walnuts, and watermelons. The season was rather unfavorable for all sorts of fruits except peaches. The varieties recommended in most instances are practically the same as those of previous years.

In some experiments in spraying peach trees with copper sulphate solutions of varying strengths for leaf curl it was found that "trees sprayed early with 1 lb. of copper sulphate to 100 gal. of water showed no more curl than trees sprayed at the same time with 1 lb. of copper sulphate to 20 gal. of water." Like results were obtained when 1 lb. of copper sulphate was used to 200 gal. of water. In the test of fall and winter pruning of peach trees *v.* spring pruning, no difference could be noted in the crops of the following season.

Of the pears grown, Bartlett, Bloodgood, Elizabeth, and Giffard are recommended for summer use; Bosc, Anjou, Duchess, Howell, Keiffer, Seckel, and Sheldon for autumn; and Dana Hovey and Winter Nelis for winter.

Of the nuts tested Paragon is considered one of the most valuable chestnuts grown at the station. Cosford and Kentish Cob filberts are considered valuable plants for ornamental purposes; they have fruited sparsely at the station. The Japan walnut (*Juglans sieboldii*) grows thriftily at the station and produces annually full crops of nuts. Pecan seedlings from Iowa, planted at the station in 1890, have grown vigorously but produced no fruit. Three-year-old hard-shelled almonds have made a strong and healthy growth, produced some flowers but no fruit. English walnuts have made a failure at the station, though the trees grow slowly.

Eighty-seven varieties of watermelons were tested at the station, the seed of which was obtained from the U. S. Department of Agriculture. Some notes are given on the results obtained, but no recommendations made.

Notes on vegetables, L. R. Taft and M. L. Dean (*Michigan Sta. Bul. 196, pp. 87-112*).—Notes on the following vegetables grown at the station in 1901 are recorded: Eight varieties of green-podded snap beans, 8 of dwarf wax beans, 4 of English dwarf beans, 3 of pole beans, 2 of bush Lima beans, 1 of the ordinary white pea bean, 18 of early cabbage, 7 of medium cabbage, 6 of late cabbage, 3 of red cabbage, 5 of kale, 3 of kohl-rabi, 5 of Brussels sprouts, 5 of cauliflower, 1 of Chinese cabbage, 34 of lettuce, 32 of peas, 19 of sweet corn, 118 of potatoes, and 84 of tomatoes. Tabulations as to date of maturity, yield, etc., are usually given, and descriptions of the more promising varieties in most instances.

Of the loose, open, crinkled varieties of early maturing lettuce, Hamilton Market and Early Curled Simpson are stated as desirable, though Grand Rapids is most largely grown for forcing purposes. Among the larger kinds of lettuce Leviathan, Maximum, and New York are considered good sorts. Giant Glacier, Golden Queen, and Crystal Palace are stated as choice varieties in the same class with Cream Butter.

Of the early market garden peas Scorcher, Prolific Early Market, and Earliest of All are considered valuable varieties, but not equal in quality to Gradus or Thomas Laxton. The latter are nearly as early as the other varieties, but more care must be taken to delay sowing them until the ground has become warm. Of the midseason or main crop varieties, Hosford Market Garden, Master, and American Wonder are among the better sorts. Stratagem and Champion of England are stated as standard late varieties, while Monarch and Blue Imperial are among the more promising of the new sorts.

In the potato test, 43 varieties were early and 75 late potatoes. Of the early potatoes, Michigan, yielding 219.29 bu. per acre, was the leading white variety. Other good early varieties were Acme, Andes, and Cole. Daughter of Rose, a second early variety, yielded 274.71 bu. per acre. Carman No. 1 and No. 3 and Sir Walter Raleigh are stated as desirable late varieties.

Fruits, vegetables, flowers, and ornamental shrubs at the experimental farms in Canada, W. T. Macoun, W. S. Blair, S. A. Bedford, A. Mackay, and T. A. Sharpe (*Canada Expt. Farms Rpts. 1901, pp. 87–108, 112, 113, 120–125, 132–135, 369–391, 429–452, 482–505, 533–558, pls. 2*).—Separate reports are given on the fruits, vegetables, flowers, and ornamental shrubs grown at the Central station in Ottawa and at the branch stations in Manitoba, Maritime Provinces, Northwest Territories, and British Columbia. These reports are largely in continuation of those for previous years (E. S. R., 13, p. 243). The data recorded consist largely of the results obtained in tests of varieties of orchard fruits, grapes, raspberries, strawberries, gooseberries, currants, rhubarb, and of the more prominent garden vegetables, such as peas, beans, onions, cabbage, cauliflower, tomatoes, sweet corn, beets, melons, cucumbers, squashes, pumpkins, lettuce, Brussels sprouts, etc. Lists are given in a number of instances of the most suitable varieties of vegetables for farmers' gardens. Tests are also reported on the hardiness and suitability to the various districts of a large number of ornamental shrubs, hedge plants, and annual and perennial flowers.

In an experiment with corn at the Maritime Station the effect of removing the suckers from the corn plant in hastening maturity was studied. The data given indicate that no apparent advantage was gained by removing the suckers. In general, the varieties of Americana and Nigra plums have given the best results at the different stations. Descriptive notes are given in some instances on some of the orchard fruits and vegetables grown.

Celery tests on American Gardening trial grounds (*Amer. Gard., 23 (1902), No. 378, p. 185, fig. 1*).—In these tests Major Clarke has proved by far the best red variety of celery grown. One of the best green varieties of celery was Evans Triumph. Winter Queen has proved itself the best of all winter celeries for 2 seasons. It is a strong plant with good heart and of excellent flavor, and has surpassed all others in keeping properties.

Growing melons at Rockyford, D. V. Burrell (*Amer. Agr. (mid. ed.), 69 (1902), No. 16, p. 558*).—Methods observed at Rockyford, Colo., in growing muskmelons are described.

Onion beginnings; seeding, packing, and shipping, H. L. Wells (*Sunset Mag., 8 (1902), No. 3, pp. 123–127, figs. 7*).—Brief description of California methods of growing and harvesting onions and onion seed. It is stated that about a half million pounds of onion seed were grown in California in 1901.

Forcing rhubarb in the field (*Amer. Gard., 23 (1902), No. 2, p. 23*).—Methods of forcing rhubarb by means of frames and stable manure are given. The frames may be made of open-ended boxes or barrels sawed off at the proper height. These should be placed over the hills and held in place by stakes and surrounded by manure. Over the frames window sash or heavy oiled "plant bed" or "protecting" cloth may be used. In the fall, before the ground is frozen, beds intended for early spring forcing should be plowed or deeply cultivated, and the ground about the plants thoroughly spaded. Thus prepared from 800 to 1,000 lbs. of complete commercial fertilizers per acre should be evenly scattered about each hill. When forcing begins a further application of $\frac{1}{2}$ to $\frac{3}{4}$ lb. of nitrate of soda per plant should be placed about the hill and thoroughly worked in, taking care not to get any considerable quantity over the crown. The manure on the outside of the frames should be piled up level and thoroughly packed down. If the rows are wide apart it need not occupy the whole space between them. It is considered best to be a little liberal and round up the spaces a few inches above the level of the edge of the frames. Immediately after the manure is put in place the glass should be closed down and kept so, no matter how high the temperature may go, until the rhubarb crown bud appears above the surface. Then the same attention must be given to airing as with the ordinary hotbed. Toward spring, when the days are getting longer and the sun hotter, the use of cloth frames or straw mats is advised in preference to glass, since the latter induces a weak and spindling growth.

Fertilizer tests on tomatoes, H. A. Huston (*Indiana Sta. Bul. 92, pp. 107-115*).—This bulletin presents briefly some statistics on the canned tomato industry of this country, and gives the results of some field experiments with fertilizers for tomatoes. The experiments were carried out during the seasons of 1899 and 1900 on moderately heavy clay loam that would naturally yield about 24 bu. of wheat or 50 bu. of corn per acre. The fertilizer formula followed in the main was that recommended by Voorhees, viz, nitrogen 4.7 per cent, phosphoric acid 7.2 per cent, and potash 12 per cent, applied at the rate of 500 lbs. per acre; and was composed of muriate of potash, nitrate of soda, azotin, and acid phosphate. This mixture cost about $32 per ton. On some plats one or more of the fertilizers was omitted, and the amounts applied on the different plats also varied. Barnyard manure applied on clover sod at the rate of 12 to 15 2-horse loads per acre formed one plat in 1900.

The best results were obtained by using a complete fertilizer in liberal amounts. The use of nitrogen alone, either in the form of nitrate or organic nitrogen, was unprofitable. The yield on the barnyard manure plat was the largest obtained with any of the fertilizers. This fertilizer had a tendency to delay and prolong the ripening period, but the total yield was very nearly double that obtained from any other plat.

On the whole, the use of the commercial fertilizers considerably increased the yields and hastened the maturity of the crop. The results also indicate that on lands of the type used where clover is grown in the rotation, a fertilizer made up of 3 per cent nitrogen, 7 per cent available phosphoric acid, and 12 per cent potash would more nearly meet the requirements of the tomato crop than the Voorhees formula and would be about $5 per ton cheaper. Earlier experiments at the station indicate that sulphate of potash gives a better quality of early tomatoes than the muriate.

The statistics included in the bulletin show that Indiana is the second State in the Union in the production of canned tomatoes, the average yearly output for the last 5 years being 697,200 cases. Each case contains 24 cans, holding 3 lbs. each. Maryland stands first in the production of canned tomatoes, with a yearly average of 1,840,000 cases.

Successful culture of tomatoes for canning, E. J. Dirickson (*Amer. Agr. (mid. ed.), 69 (1902), No. 14, p. 491*).—The method observed by the author in growing from 50 to 80 acres of tomatoes each season is given. The varieties Ignotum, Trophy, and Favorite are the varieties used, and all considered equally good.

Mushroom culture in France, J. K. Gowdy (*U. S. Consular Rpts., 68 (1902), No. 259, pp. 537-541*).—A popular article describing in detail the culture of mushrooms as observed by growers in the abandoned mines about Paris. In this work the cost of mushroom culture is estimated as follows: Manure, 10 cts.; labor, 20 cts.; rent, 2 cts.; total, 32 cts. The receipts per square yard are 6 lbs. mushrooms, 90 cts.; spent manure, 5 cts.; total, 95 cts. It is believed that if proper means were used to destroy the insects affecting the mushrooms the receipts per square yard might be increased to $2.

Culture of the edible mushroom Tricholoma nudum, J. Costantin and L. Matruchot (*Rev. Gén. Bot., 13 (1901), No. 155, pp. 449-475, pl. 1, figs. 4*).—The culture of the spawn and the production of mushrooms therefrom have been studied, together with the parasites and anomalous growths affecting this plant. The cultures have been made in caves, greenhouses, open gardens, and forests, also in sterilized tubes. As a medium in which to grow, beech, poplar, maple, and oak leaves have been used, also spent tan bark, manure, etc. The results secured, both in the production of spawn in these media and in the growth of the mushrooms above ground, are reported at length and in detail. They show that spawn can be obtained in abundance by seeding spores in pure cultures. In commercial work spawn has been very successfully grown in heaps of beech or oak leaves or in spent tan bark. With poplar leaves, on the other hand, the mycelium developed very poorly. The fruiting of *T. nudum* has been successfully accomplished in heaps of tan bark and beech leaves, less often in oak leaves. With the special manures used in growing cultivated mushrooms no fructification was obtained, though the spawn developed. The duration of the period of incubation of the spawn, that is, from the time the spawn is seeded until the appearance of the mushrooms above ground, has been on the average 10 to 12 months. In caves the harvest has lasted 2 to 3 months and a less time in the open air. The spawn seems to be of a perennial nature, and in one experiment fructified three years in succession. As compared with cultivated mushrooms, the returns from *T. nudum* are inferior; on the other hand, the medium of culture is cheaper and the preparation of special manures is not required, the mycelium is vigorous, the mushroom may be cultivated out of doors and in forests, and is much more hardy than the cultivated mushrooms.

Experiments in grafting, H. Lindemuth (*Gartenflora, 51* (*1902*), *No. 1, pp. 12–15*).—When *Solanum erythrocarpum* was grafted on *S. lycopersicum* June 29, it grew so luxuriantly that by July 9 it was ready to be transferred from pots to the open field. At first the graft did not grow quite as rapidly as ungrafted plants, but later overtook and surpassed them in luxuriance, attaining a total height of 1.48 meters. Other plants that have grown exceptionally well when grafted on strong growing stocks have been Physalis on potatoes, *Arabis albida* on cole, and *Solanum auriculatum* on *S. tuberosum*. It is believed that grafting on strong growing stock is only at the beginning of its importance.

Wallflower was grafted on red cabbage August 1, wintered in a cold house, and planted out the following summer. Both grew. The cabbage sent out sprouts and formed a solid head weighing 800 gm. At the time of writing the wallflower had formed buds. *Abutilon thompsoni* grafted on *Althæa narbonensis* made a strong growth, much beyond its usual season. *Petunia hybrida* has been grafted on potato stalks, but with unfavorable results. The best stock found for Petunia has been *Nicotiana tabacum*. Two plants of *Abutilon thompsoni*, grafted on *Sida napæa* stocks 25 cm. long and treated in the same manner, developed 3 stems each. The leaves on one plant were intensely variegated in color, while on the other they remained green. No explanation of the effect could be given.

Influence of stock on scion, L. H. Pammel (*Amer. Gard., 23* (*1902*), *No. 372, p. 86*).—An instance is cited of the use of the frost plum seedlings as stock for the Welling plum, a variety similar to the De Soto. The fruit produced was nearly worthless and similar to the frost plum. De Soto plums grafted on De Soto produced fruit on a dozen trees that was very different from the De Soto in size, color, and quality.

Influence of the hardness of wood in grafting cider apples, E. Leroux (*Jour. Soc. Nat. Hort. France, 4. ser., 3* (*1902*), *Jan., pp. 48–66, fig. 1*).—A general discussion is given of the influence of the hardness or density of wood in grafting cider apples, and 200 varieties of these apples are arranged alphabetically and classified as to the relative hardness of the wood of each variety. The numerous observations along this line which have been made by the author have led to the following conclusions: (1) In the culture of cider apples varieties with tender wood can be most successfully grafted on stocks having tender wood, or varieties with hard wood on stocks having hard wood; (2) success follows only rarely when a variety with tender wood is grafted on a stock having hard wood; (3) success seldom or never follows when a variety with hard wood is grafted on a stock with tender wood. These principles are believed to apply to other orchard fruits as well as to apples.

The home fruit garden: Preparation and care, L. C. Corbett (*U. S. Dept. Agr., Farmers' Bul. 154, pp. 20, figs. 6*).—A popular discussion of the planting out and care of a home fruit garden, including orchard and small fruits. Plans are given showing the position of the different fruits in the garden, and of a combined fruit and vegetable garden.

Canning of fruits and vegetables, G. C. Butz (*Pennsylvania State Dept. Agr. Bul. 91, pp. 57, figs. 8*).—This is a popular presentation of the subject of canning fruits and vegetables on a commercial scale. Some statistics of the canning industry are given, together with notes on the historical development of canning, location of canning factories, capital required in starting a factory, and the machinery necessary. The methods observed in canning tomatoes, corn, peas, beans, squash, pumpkins, and various fruits are noted in some detail. The bulletin also contains a bibliography of the publications concerning the canning of vegetables and fruits; a list of the supply houses and manufacturers of canning-factory machinery and materials; list of canned goods brokers; list of the canning factories of the United States, and dimensions of the standard-sized cans and boxes for fruits and vegetables.

The orange in southern California, J. W. Jeffrey (*California Cult., 18 (1902), No. 2, pp. 17, 29, fig. 1*).—A handy condensed summary of the extent of the orange industry and of cultural methods in southern California.

Orange conference (*Bul. Bot. Dept. Jamaica, 9 (1902), No. 1-2, pp. 1-25*).—A reprint of the papers presented at the orange conference held under the auspices of the board of agriculture December 4, 1901. The subjects of varieties, situations for orchards, propagation and treatment in orchards, irrigation, insects and diseases affecting, with notes on natural and artificial remedies, are considered.

Report on cooperative experiments with small fruits, H. L. Hutt (*Ontario Agr. and Expt. Union Rpt. 1901, pp. 24-31*).—The form of contract entered into between the Union and cooperative experimenters is given, together with the cultural instructions sent to experimenters with each of the following crops: Strawberries, raspberries, black raspberries, blackberries, currants, and gooseberries. A brief summary of reports sent in on the growth of these fruits secured by experimenters in different districts is included.

Strawberry notes for 1901, L. R. Taft and M. L. Dean (*Michigan Sta. Bul. 195, pp. 75-85*).—Notes and tabulated data in continuation of those reported for previous years (E. S. R., 13, p. 456) are recorded for 170 varieties of strawberries. The tabulation includes the usual data on blooming and ripening period, vigor, hardiness, productiveness, size, form, color, quality, and firmness of the strawberries. In place of some of the older early varieties of strawberries, such as Michel Early or Beder Wood, the authors suggest the use of Excelsior, Stone Early, or Mayflower, which seem to have some superior characteristics. Valuable large berries of high quality are Marshall, Wm. Belt, and Sample. For market berries where quality is desired, Excelsior for early, followed by Warfield, Haverland, Clyde, Sample, Wm. Belt, and Bubach, are recommended.

A preliminary note on the enzym in tea, M. K. Bamber and H. Wright (*Indian Gard. and Plant., 10 (1902), No. 9, pp. 152-154*).—A discussion of the nature of enzyms in tea and of their use in tea manufacture.

Cultivation of pepper in the Bombay Presidency, J. Mollison (*Agr. Ledger, 1901, No. 3, pp. 33-40*).—This article deals mainly with analyses of the pepper plant and typical soils on which pepper is grown, made with a view to determining the best system of manuring for this plant.

Congress for the hybridization of the grape, L. J. Grandvoinnet (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), Nos. 50, pp. 709-714; 51, pp. 743-745; 52, pp. 771-774;*

23 (*1902*), *No. 2, pp. 46–51*).—Herewith is given a summarized account of the papers and reports presented to the hybridization congress for grapes, held at Lyons from November 15 to 17, 1901. At this congress direct producers were advised for temperate or cold regions, where the attacks of phylloxera are of less importance than in the middle or warmer portions of France. These plants are quite resistant to winter freezing and give very satisfactory harvests. They are especially advised in planting parcels of ground of mediocre value, where neither much attention nor manure can be given to them. Wines made from grapes grown in these positions are very satisfactory for household purposes, and are made at considerably less expense than with grafted vines. The number of new hybrid direct producers within recent years is considered of sufficient importance to call the attention of viticulturists to a study of their merits. While the resistance of these new hybrids to phylloxera is not absolute, it is considered superior to older sorts and grafted plants, and sufficient for the center, southeast, and northeast portions of France.

Table of comparative merits of grapes, T. S. Hubbard (*Amer. Gard.*, *23* (*1902*), *No. 378, p. 186*).—A scale of points showing the comparative size of berry and cluster, quality for table use, earliness in ripening, hardiness of bud and cane, health of foliage, vigor of growth, productiveness, shipping and keeping quality, and compactness of cluster is given for 62 varieties of grapes grown in the grape belt of western New York.

Bench grafting resistant vines, B. Bruck (*Pacific Rural Press, 63* (*1902*), *No. 9, p. 152*).—Account of method, cost, and results. It is shown to be cheaper and to give more satisfactory results than vineyard grafting.

Direct producers, Ravez, Bonnet, Bouffard, Dupont, and Rey (*Ann. Ecole Nat. Agr. Montpellier, n. ser., 1* (*1902*), *No. 3–4, pp. 195–309*).—Brief notes on the characteristics of a large number of varieties of direct producers grown at the school, accompanied by analyses of the must and wine in each case.

Tests of commercial fertilizers on vines, E. Chuard and C. Dusserre (*Chron. Agr. Canton Vaud, 15* (*1902*), *No. 2, pp. 38–45*).—Herewith are recorded the results of experiments with commercial fertilizers as a supplement to barnyard manure for grapes. The experiments bring out the fact that instead of the exclusive use of barnyard manure, which is expensive, may be substituted in part commercial fertilizers. The experiment shows that about as good results are obtained when only half the usual amount of barnyard manure is employed and this supplemented by superphosphate or Thomas slag, sulphate of potash, and a moderate annual application of nitrate of soda. The quantity of the latter should be reduced with vigorous growing vines, while on other soils it may be increased to 400 kg. per hectare per year.

Phosphoric acid and wines, G. Paturel (*Ann. Agron., 28* (*1902*), *No. 1, pp. 5–30*).—The author reviews the work of other investigators on the composition of fruit and vines of grapes and of wines, and reports the results of his own studies on the relation of the phosphoric acid in soils and grapes to the quality of the wine produced, and on the influence of methods of fertilizing and fermentation on the proportion of phosphoric acid found in the wine. These researches show that the grape takes a very small amount of phosphoric acid from the soil, much less than of potash and nitrogen. A vineyard requires from 7 to 15 kg. of phosphoric acid per hectare annually. The larger part of this is returned to the soil in the leaves, prunings, and marc. That removed in the wine and thus lost to the soil does not exceed 3 kg. per hectare, but in spite of the small amount required, it has been noted that phosphatic fertilizers very frequently produce beneficial results as regards maturity and quality of the grapes and their resistance to cryptogamic diseases. The work of Müntz has shown that there is a relation between the phosphoric acid content and the quality of wines of different origin. The author has found the same relation, although much less marked, in different wines of the same region. His examination of the wines of Beaujolais and Mâconnais showed an absolute correlation between the richness of the wines in phosphatic substances and their commercial value based on quality. Almost all of the phosphoric acid of red wines is derived from the juice of the grapes in which this substance occurs in solution. The solid parts (stems, seeds, and skins) yield only insignificant amounts of phosphates to the wine except when subjected to fermentation. These results indicate the desirability of increasing the phosphoric acid content of wines. This may be done by three methods, (1) the use of phosphates in the wine vat, (2) modifications of the process of vinification, especially a more prolonged contact of the marc with the fermenting wine, and (3) the use of phosphatic fertilizers.

Manuring vines, E. H. RAINFORD (*Queensland Agr. Jour., 10 (1902), No. 3, pp. 187–190*).—A compiled article showing the necessity for manuring vines and the best fertilizers to apply on different soils.

Grafting and budding walnuts (*California Cult., 18 (1902), No. 4, p. 53*).—Directions are given for successfully grafting and budding walnuts.

Etherizing lilacs for early forcing, F. HARMS (*Möller's Deut. Gart. Ztg., 17 (1902), No. 1, pp. 8–11, figs. 3*).—The author describes in some detail methods of etherizing plants (E. S. R., 12, p. 243), and gives some results obtained by himself in forcing lilacs which had been etherized. When the lilacs were etherized for 48 hours and afterwards placed in the forcing house, they started into growth 3 to 4 days later and were in full bloom in 25 days. Plants not etherized did not bloom for 8 to 10 days later.

The effect of ether in forcing plants (*Amer. Florist, 18 (1902), No. 720, pp. 319–321, figs. 4; Gardening, 10 (1902), No. 230, p. 213, figs. 4*).—This report is abstracted from *Le Jardin*, and summarizes the results of experiments in the ether forcing of plants at an experiment station in Dresden. Etherized lilacs were brought into full bloom within 18 days after bringing in the house. Treated shrubs forced early flowered much more freely, and were 8 to 10 days earlier than untreated. In general, etherized plants were found to force at a much lower temperature than those not treated. *Azalea mollis* and the viburnums have responded readily to the treatment. Less success has been obtained with *Prunus triloba*, Deutzia, and roses. Forty per cent of etherized lily of the valley plants flowered, when placed in heat, November 21, at 75° F., while but 2 per cent of untreated plants flowered under the same conditions. The effect of the ether in forcing becomes less marked as the flowering season of the plant in question approaches. It is, therefore, considered of greatest value in November and December.

Ether forcing of plants, A. MAUMENE (*Amer. Gard., 23 (1902), No. 381, pp. 338, 339, fig. 1; abs. from La Nature*).—The object and methods of etherizing plants are discussed. In the forcing of shrubs it is stated that it is absolutely necessary that vegetation should be completely arrested and the plants brought to a period of repose. When the fumes of ether envelop the branches of the shrub they accelerate vegetation, cause the leaves to wither, and ultimately arrest growth, the same as the first frosts of autumn. After treatment the plants may be immediately placed in the forcing house. The European experiments have shown that etherization is of most use when applied from July to the first of September. Etherization should take place in closed compartments having a temperature of not less than 17 to 18° C. About 400 gm. are considered sufficient for a cubic meter of air. The time of exposure to the fumes of the ether should be about 50 hours.

Watering with hot water (*Amer. Gard., 23 (1902), No. 370, pp. 53, 54*).—The value of drenching plants that have become sickly with water having a temperature of 125 to 130° F. is noted. Sufficient water should be used to carry off any acidity of the soil that may be present. In addition, it is suggested that fertilizers be used at the same time in the rejuvenation of the plants. In the article good results are reported with such plants as Clivia, palms, Ficus, Begonia, Aspidistra, Primula, and Dracæna.

Methods and results of sterilization, G. E. Stone (*Amer. Florist, 18 (1902), No. 718, pp. 194–196*).—Besides the value of sterilized soils in preventing certain diseases in the greenhouse, it has also been found of practical value in increasing the growth of the crop. The paper discusses in considerable detail the present use and methods of sterlizing soil in the greenhouse.

A new spring flowering iris (*Amer. Gard., 23 (1902), No. 373, pp. 104, 105*).—An account is given of a new race of hybrid Alpine irises, which commence blossoming in early spring and continue until the end of April or first of May. The race was originated by W. J. Caparn, of England, an amateur gardener. The range of color in the new race runs from pure white selfs through the various shades of yellow and blue. The race is also valuable for forcing.

Growing water lilies from seed, G. B. Moulder (*Amer. Gard., 23 (1902), No. 378, p. 191, fig. 1*).—Methods observed in growing the different species of water lilies from seed are given.

The hybridization of orchids and their culture from seed, A. Hefka (*Möller's Deut. Gart. Ztg., 17 (1902), No. 1, pp. 4–7, figs. 6*).—A discussion is given of the principles to be observed in the hybridization of orchids to secure desirable qualities in the hybrids, and of the method of growing orchids from seed. The author was most successful in growing the seed on cut moss placed in low, flat pots with large holes in them so that water could be absorbed from below. The seed is never sprinkled or watered from above. The seed should be sown at about the time the mother plant usually starts into growth, as otherwise they are apt to remain dormant for a much longer period. The first roots usually appear in from 3 to 6 months after seeding, and as soon as 2 leaves are formed the plants are ready for transplanting to pots or baskets. Good illustrations are given, showing the growth of seedling orchids in pots.

Winter protection for tea roses (*Amer. Gard., 23 (1902), No. 381, pp. 239, 240*).—Tea roses were kept in perfect condition in cold frames or when enveloped in straw or straw bundles. Twenty-five per cent of the plants died when protected over winter with dry leaves only. When protected with dry leaves and earth about 10 per cent died. With no other covering than strawy manure about 50 per cent of the plants died.

Fertilizers for sweet peas (*Amer. Gard., 23 (1902), No. 378, p. 188*).—A comparison was made between muriate of potash combined with mineral superphosphate of lime and with sulphate of ammonia for sweet peas. The sulphate of ammonia was applied in solution at the rate of 2 oz. to 4 gal. of water. The result from the use of the sulphate of ammonia was a much closer jointed and firmer growth than with muriate of potash, but the plants did not bloom as freely nor were the blooms as large. The color of the flowers, however, was equally good, and they lasted much longer when cut and also when left on the haulm.

FORESTRY.

A working plan for forest lands near Pine Bluff, Arkansas, F. E. Olmsted (*U. S. Dept. Agr., Bureau of Forestry Bul. 32, pp. 48, pls. 9, figs. 9*).—This bulletin contains a detailed working plan for a forest tract made in cooperation between the Bureau of Forestry of this Department and the owners of the timber land, Sawyer and Austin Lumber Company. The tract of land comprises 105,000 acres, about 5 per cent of which is bare of merchantable timber. The forest is divided into 3 types of forest growth: Pine ridge, which embraces 65 per cent; pine flat, 20 per cent; and hardwood bottom lands, 15 per cent. The principal species of trees are the short-leaved pine, loblolly pine, cow oak, white oak, white ash, and several species of hickory. These different species are described and sylvicultural notes given regarding them. A careful estimate of the entire tract shows that it may be worked as a sustained annual yield of 14,500,000 ft. per year. The present capacity of the mills erected by the company is 40,000,000 bd. ft. per year, and in order to keep them at their full capacity it would be necessary to increase their area by 170,000 acres of forest land similar to the tract reported upon. A brief summary of the rules laid down for lumbering limits the cutting of pine to 14 in. on the stump and hardwoods 20 in. A certain number of pine trees over 14 in. on the stump are to be left standing for seed purposes, and wherever practicable the hardwoods on the pine lands are to be cut off. All pine trees 18 in. or over in diameter are to be sawn not higher than 18 in. from the ground, and those below this diameter at 12 in., and care is to be used in felling that as little damage as practicable be done to the young growth.

Massachusetts forestry, W. R. SESSIONS (*Massachusetts State Bd. Agr. Rpt. 1901, pp. 322–330*).—Some suggestions are given for future action for the reforesting of the cheap lands of the State. On account of the uncertain income to be derived from forest production the author believes that the State should take up the matter, and not leave it for private enterprise. One of the important features in connection with reforesting the State is the protection of the water power and water supply by furnishing a mature forest cover for the hills from which the streams receive their supply of water. It is believed that a large part of the wooded land, waste, and semiwaste land of the State should be purchased and controlled by the State government. Many of these lands can be purchased at a comparatively low valuation, and if the results should prove financially successful, the revenue would necessarily go to the State, reducing the taxes in the various localities.

Report of the superintendent of forestry for Canada, E. STEWART (*Rpt. Dept. Interior Canada, 1901, pt. 8, pp. 25, pls. 7*).—This report gives the details of the work of the office of the superintendent of forestry, in which the development of tree planting in the Northwest Territories is shown, and the details of the operations conducted in various parts of the Dominion are indicated. Notes are given on forest protection from fire, and brief descriptions given of the timber reserves in Canada. Those described are the Riding Mountain reserve, Spruce Woods reserve, Turtle Mountain reserve, Moose Mountain reserve, the Foothills reserve, Rocky Mountain Park, and the railway belt in British Columbia, which consists of a territory about 500 miles in length by 40 in width along the main line of the Canadian Pacific Railway. An account of the tree planting which has been conducted in the plains region is given, and a plan of cooperation for government tree planting is outlined. In addition, the reports of the assistant superintendent, forest inspectors, and forest rangers are given in the appendix.

Annual report of the director of forestry of the Province of Ontario, 1900–1901, T. SOUTHWORTH (*Rpt. Dir. Forestry, Ontario, 1900–01, pp. 53*).—This report contains an account of the condition and management of the forest reserves in Ontario, together with an appendix on the production of tannin in the same province. The subject of the cutting off of the timber in the older portions of the province has received considerable attention and has been investigated through the aid of the latest obtainable statistics. An analysis of these returns shows that the proportion of wooded land in most localities is steadily decreasing. The necessity of correcting this process of deforestation is evident, but the steps to be pursued to prevent it are not apparent. A compilation of the legislation enacted in many of the States of the United States for the encouragement of tree culture and forest maintenance is given as a suggestion for legislative action to remedy the evils of deforestation.

Management of the farmer's wood lot, W. N. HUTT (*Rpt. Dir. Forestry, Ontario, 1900–01, pp. 54–62, figs. 6*).—A description of the average farmer's wood lot is given, which consists usually of mature trees, trees past maturity, prematurely developed trees, healthy growing trees, coppice and seedlings, and stump and waste land. Methods of replanting are discussed, and the methods of reproduction of different species are shown. The methods of seeding and planting the different varieties of trees are described, and different kinds of trees are recommended for the different conditions of soil, exposure, etc. The kinds of trees recommended for planting are white pine, chestnut, elm, hickory, basswood, ash, maple, white oak, cedar, and black walnut. The value of mixed plantations is shown, and the necessity for trimming and thinning pointed out.

Experiments in tree planting on Sable Island, W. SAUNDERS (*Canada Expt. Farms Rpts. 1901, pp. 62–77, pl. 1*).—Sable Island, which lies off the coast of Nova Scotia, is about 21 miles long and about a mile across. The island formerly was much larger in extent but being of a sandy nature is gradually being washed away by the action of the winds and waves. There are no trees found on it and the gradual wasting away of the island has led to the consideration of the possibility of establishing tree growth there and thus fixing the soil. In 1900 the author was requested to investigate the subject of foresting this island, and taking advantage of his presence in Europe, visits were made to a number of regions in France where forest operations had been conducted in sandy land. As a result of his investigations, a selection of trees and shrubs, which were thought to be adapted to the purpose, was made, and 81,345 plants, representing 25 varieties of evergreens and 79 of deciduous trees and shrubs, were secured and sent to the island. The planting operations were conducted in the summer of 1901, the details of which are given. At the end of the season a report was made on the condition of the trees and seedlings, from which it appears that a protracted drought killed many of the weaker plants and the high winds, which occurred toward the end of September, caused the leaves on many of the deciduous trees to wilt and appear as though scorched by fire. All the evergreens, with the exception of the white pine, seemed to have done quite well. The experiment thus far has covered too brief a period to permit the forming of a very definite opinion as to the ultimate success of tree planting on Sable Island.

Forest belts, W. T. MACOUN (*Canada Expt. Farms Rpts. 1901, pp. 127–132*).—The forest planting at the Central Experimental Farm has been made in belts along the northern and western boundaries, that on the western boundary being 165 ft. wide and the northern 65 ft., the total length being a little less than 2 miles. The total number of trees planted is 23,300. The plantings were made to gain information regarding the growth of the best timber trees when grown on different kinds of soil and at different distances. The first trees have been planted 13 years, and the results obtained warrant the extensive planting of timber trees under similar conditions. The best results were obtained where the trees were planted 5 ft. apart each way. Such trees have clean trunks and will produce the best timber. A table is given in which the average height and diameter of the different varieties of trees are stated, together with the growth during the season covered by the report. Black walnut, butternut, white elm, and Norway spruce have not made satisfactory growth owing to the unsuitability of the soil and other causes. Notes are given on the plantings that have been made in the arboretum and botanic gardens. There are now living in the arboretum more than 4,200 specimens of trees and shrubs which have been obtained from many sources.

Notes on the arboretum, S. A. BEDFORD (*Canada Expt. Farms Rpts. 1901, pp. 438–442*).—A report is given of the arboretum maintained at the Manitoba branch station. No additions were made during the season covered by the report, but notes are given on the hardiness of trees and shrubs previously planted.

Trees and shrubs, A. MACKAY (*Canada Expt. Farms Rpts. 1901, pp. 493–498*).—The condition of the trees and shrubs which had been planted at the substation in the Northwest Territories is said to be very satisfactory. During the past 12 years the demand for trees and shrubs from the experimental farm has been much greater than the supply, and the demand has steadily increased, especially from the southern portion of the Territories. Notes are given of a list of species and varieties under test, in which their relative hardiness is shown.

The hardy catalpa, H. F. Roberts (*Kansas Sta. Bul. 108, pp. 99–140, pls. 31*).—The author has brought together such information as is available to show the economic value of the hardy catalpa (*Catalpa speciosa*) for Western planting. Although 2 forms of catalpa have been known as indigenous to the United States for a long time, it was not until the latter half of the nineteenth century that the two were considered as specifically distinct. The systematic relationships of the hardy and other species of catalpa are discussed at some length, after which notes are given on the durability of the timber of the hardy species. Evidence is presented which shows that for posts, railroad ties, telegraph poles, etc., the timber exhibits great durability in contact with the earth. In planting catalpa the seed should be sown in seed beds and afterwards transplanted to the permanent plantation. In the earlier plantings the trees were set at a distance of 4 by 4 ft., the idea being by close planting to cause the trees to become naturally pruned and force the growth into a straight trunk. The catalpa differs, however, from other forest trees in that its dead limbs are not readily dropped. In order to secure clean, smooth trunks, systematic pruning is necessary, which should be begun when the trees are 5 or 6 years old, and the limbs should be cut off to a distance of 5 or 6 ft. from the ground. The proper distance for planting is rather imperfectly known, and the results of a number of artificial plantations are given. The rate of increase in diameter of catalpa trees varies according to soil, water supply, and distance of planting. Trees planted at a distance of 4 by 8 ft. in the interior of plantations increase about ½ in. per year in diameter after about 10 or 12 years. The thinning processes should be begun after the trees have been planted 8 or 10 years by the removal of half the trees. In general, the proper time for cutting should be during the months of August and September. This will prevent the return to the trunk of the soluble food in the leaves which would furnish nutriment for bacteria and fungi.

The cost and profit of catalpa growing, based upon results obtained in a number of plantations, are given, from which it appears that a net profit of about $20 per acre for the first 10 years can be obtained, leaving the products still standing in the plantation worth about $400 per acre. The value of catalpa for railroad ties is discussed at considerable length and the results of a number of tests conducted by railroads are given. Several commercial catalpa plantations are described which have been made since 1870.

The catalpa plantations at the agricultural college, A. Dickens and G. O. Greene (*Kansas Sta. Bul. 108, pp. 141–145, pls. 8*).—An account is given of the plantings of catalpa at the Kansas Agricultural College which have been made since 1872. Very encouraging results have been obtained, and on very poor soil the catalpa has made a paying crop. On good soil the growth was proportionately better. In from 7 to 10 years growth of suitable size for posts was produced, and in 20 to 25 years sufficient size for lumber or other purposes. The best distance for planting appears to be 5 to 6 ft apart in rows 8 ft. distant. Clean cultivation should be given the trees for several years and pruning should be resorted to to produce straight, desirable growth. The trees are easily raised, readily transplanted, grow rapidly, and endure extremes of drought, heat, and cold.

The western red cedar, W. M. Bomberger (*Proc. Iowa Park and Forestry Assoc., 1 (1901), pp. 17, 18*).—The western red cedar (*Juniperus scopulorum*) is said to require considerable heat and withstand drought to a remarkable extent. On this account it is considered one of the most valuable of evergreen trees for growth on the elevated plains country of Iowa, Minnesota, Dakota, Nebraska, Kansas, Oklahoma, and Colorado. Two common forms are briefly described; one, which is indigenous along the Platte River in Nebraska, is considered best for general planting; the other form native in the Rocky Mountains is characterized by the glaucous color of its foliage, and is better adapted for ornamental plantings.

A forestry plantation after thirty years, E. Reeves (*Proc. Iowa Park and Forestry Assoc., 1 (1901), pp. 21–24*).—An account is given of a plantation made in 1869 which included about 8 acres of European larch and about an acre each of Scotch, Austrian, and white pine, and Norway and black spruce. Besides this, seeds of soft maple, white ash, white elm, box elder, walnut, butternut, chestnut, and catalpa were planted. On the whole, the larch made the most satisfactory growth, followed by the white pine. The best specimens of larch were a foot in diameter and 60 ft. in height in 1901. The white pine had attained nearly the same diameter and a height of about 35 ft., the other species showing less satisfactory growth. The catalpa did not prove hardy and was several times killed back by the severe cold of winter. The only returns received from this plantation were about $200 worth of telephone poles cut in January, 1900. As the land was estimated as being worth $55 per acre, the author does not believe that the planting was a financial success.

Shelter planting, W. M. Bomberger (*Proc. Iowa Park and Forestry Assoc., 1 (1901), pp. 18–21*).—The author describes his experience in planting shelter belts on 2 farms, by which ample protection was secured in from 8 to 9 years. He suggests that in planting such belts the Scotch and Austrian pine among evergreens and the cottonwood of deciduous trees are the best to begin with. After these are established other species may be introduced as occasion demands. Clean cultivation of the rows should be continued for 1 or 2 years after the grove is planted, and on the whole the trees should be set at distances of about 8 by 8 ft. The white pine is said to be one of the best species for such planting, and although making little growth for the first few years, it afterwards made a terminal growth of 18 to 32 in. per season, depending upon the moisture and other conditions. During the first 3 winters a mulch of brush or straw is said to be of decided advantage in protecting the trees.

Forest trees for park purposes, J. T. D. Fulmer (*Proc. Iowa Park and Forestry Assoc., 1 (1901), pp. 29–33*).—The relative value of a number of trees for park purposes in Iowa is indicated. Among the trees described are the ash, box elder, buckeye or horse chestnut, sycamore, elm, various maples, chestnut, poplar, hackberry, and several species of oak.

The decay of timber and methods of preventing it, H. von Schrenk (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 14, pp. 96, pls. 17, figs. 27*).—This bulletin gives a report in which the structure of timber is considered and the factors which cause the decay of wood are described at some length. Accounts are given of attempts which have been made to preserve timber from decay. An experiment which has been begun in connection with some railroads in eastern Texas is briefly described. In this experiment railroad ties consisting of different varieties of oak, beech, hemlock, tamarack, and pine have been subjected to a number of different treatments which are claimed to protect the ties against decay. These railroad ties have been treated and laid in the usual manner of railroad construction, and records will be kept of the length of their service. In connection with his investigations, the author visited various countries in Europe, and gives a report on the results of timber impregnation experiments in those countries. An appendix to the report shows the forms of specifications and contracts which are in use at present by various European lines of railway.

SEEDS—WEEDS.

The intramolecular respiration of seeds, E. Godlewski and J. Polzeniusz (*Ann. Agron., 28 (1902), No. 3, pp. 151–165*).—This article gives the results of an extensive series of experiments with seeds and various fungi, in which the intramolecular respiration was studied. The authors claim that their investigations show a marked analogy between intramolecular respiration and alcoholic fermentation, if not indicating the identity of the two phenomena. Peas, beans, barley, castor beans, etc., were experimented with, and it is claimed that when deprived of oxygen the peas were able to produce a true alcoholic fermentation. The decomposition of the saccharose, which at the end of the experiment seemed to be converted into a form of invert sugar, seems to indicate that the presence of amylase is necessary for the transformation ot starch into glucose. The experiments are briefly summarized by the authors, who claim that the intramolecular respiration of seed and of all vegetable organisms whose products of respiration are formed from hydrolysable carbohydrates is identical with alcoholic fermentation. In the absence of air, peas not only ferment the carbohydrate reserves, but accomplish the decomposition of such carbohydrates as glucose and saccharose which have been artificially added. In pure water peas transformed 22 per cent of their original dry matter into alcohol, and in the glucose solution 27 per cent was produced. The fermentation of starch presupposes the formation of amylase, and the decomposition of saccharose depends upon inversion. It is believed that the formation of enzyms in the absence of oxygen depends upon the nitrogenous material present, and they can not be considered as oxidation products of albuminoids. In a solution of saltpeter peas were able to partially reduce the nitrate, but the nitrite formed ultimately destroyed the seed. The intensity of intramolecular respiration is directly dependent upon the temperature, but the total production of alcohol and carbon dioxid is independent of it. Different kinds of seeds vary in their respiratory capacity, those of legumes possessing it in a high degree, cereals less so, and in oil-bearing seeds it is reduced to a minimum. Intramolecular respiration or alcoholic fermentation is the first phase in the normal respiration of plants whenever that depends upon the hydrolysis of carbohydrates. Whenever there are no carbohydrate reserves, respiration is dependent upon the direct action of oxygen, but there is no relation between these two functions. The chemical processes which take place within the plant cell during respiration are not identical with all cells of the same type, but the phenomena vary with the nature of the material entering into the respiration.

Tests of the vitality of seed grain and other seeds for 1901, W. SAUNDERS (*Canada Expt. Farms Rpts. 1901, pp. 58, 59*).—A report is given of a number of samples of seed grain and other seeds which were tested for vitality during the season of 1901. The total number of samples tested was 2,385, of which 900 were wheat, 312 barley, 972 oats, and the remainder mostly field and garden seeds. The maximum and minimum percentages, as well as the average vitality, for the lot are shown. In some instances the averages are quite low, due to the fact that a number of samples of very low germinative ability were tested. A table is also given showing the results of the grain tests for each province.

How long may beet seed be stored? F. LUBANSKI (*Bl. Zuckerrübenbau, 8 (1901), No. 17, pp. 259-263*).—An account is given of experiments conducted at the experiment station of Nemereze, Podolia, Russia, on the vitality of stored beet seed. Two lots of seed of the harvest of 1892 were selected for the experiment, half of which were stored in a double linen bag, the other hermetically sealed in a jar. Beginning in 1893, samples of seed from each lot were tested bimonthly for 3 years, and thereafter semiannually for 4 years. In every case a gradual diminution in vitality was noted, the seed kept in sacks falling from an average of 133.1 to 50 germinations per 100 seed bolls in 14 days and those hermetically sealed depreciating from 133.7 to 0 germinations in the same time. When tested at bimonthly periods the seed gave higher percentages of germination during the spring and summer months than when tested during the winter.

Report of the Skara Chemical and Seed-Control Station, 1901, S. HAMMAR (*Ber. Verks. Skara Kem. Sta. Frökontrollanst., 1901, pp. 32*).—Chemical analyses to the number of 6,482 were made during the year, and 353 tests of seed and 686 kg. of oats were certified to. Cereals, clover, and grass seed were most commonly submitted for examination for their purity, germination ability, etc.

Weed seed as an indicator of the origin of clover and grass seed, O. Burchard (*Landw. Vers. Stat., 56 (1902), No. 4, pp. 297–302, pl. 1*).—In continuation of the opinions expressed in the author's book relating to this subject (E. S. R., 11, p. 1054), a further discussion is given of the value of the weed seed contained in clover and grass seed as an indication of the region in which the seed was grown. The author still maintains that certain common weed seed characterize the clover and grass seed of different countries. Descriptions are given of a number of species of weed seed which are occasionally found in clover and grass seed imported into Germany. The species described are *Apiastrum patens*, found in timothy seed from North America; *Verbena angustifolia*, *Solanum carolinense*, and *Cuphea viscosissima*, in North American red clover seed; *Grindelia squarrosa*, in alfalfa seed from the United States; *Argemone alba*, in South American alfalfa seed; and *Sideritis scordioides* and *Leontodon crispus* in red clover seed from the south of France.

Noxious weeds, T. N. Willing (*Rpt. Dept. Agr. Northwest Territories, 1901, pp. 56–64*).—A report is given by the chief inspector of noxious weeds of the inspection work conducted during the past season for the enforcement of the law relative to the destruction of noxious weeds. This includes inspection of farms, public lands, etc., as well as elevators and mills. Attention is called to the necessity of the use of clean seed in sowing to prevent the spread of weeds. On the whole the enforcement of the law is in a fairly satisfactory condition.

New method for combating wild radish and mustard, Heinrich (*Landw. Ann. Meckl. Patriot. Ver., 1900, No. 26, pp. 201–203; abs. in Centbl. Bakt. u. Par., 2. Abt., 8 (1902), No. 23, p. 749*).—The results of experiments in which 15 to 40 per cent solutions of Chili saltpetre, ammonium sulphate, and potassium chlorid were sprayed over weed-infested fields. The weeds were affected similarly as when sprayed with an iron sulphate solution, while the cereals, clover, peas, vetches, lupines, and beets were not injured. The cost of the application, when the fertilizing value of the solution is considered, is not so great as other means that have been recommended.

DISEASES OF PLANTS.

Plant diseases of 1901, W. Paddock (*Colorado Sta. Bul. 69, pp. 23, pls. 9*).—The principal purpose of this bulletin is to stimulate a greater interest in plant diseases and call attention to some of the prevailing ones. Among those mentioned are apple-tree root rot, apple-tree rosette, injury of apples from improper spraying with Bordeaux mixture, blackberry-root disease, asparagus rust, aster wilt, currant cane disease, grape anthracnose, pea-root disease, plum-leaf blight, potato diseases, strawberry-leaf blight, and stinking smut of wheat.

The apple-tree root rot was noted in various localities in the State, and is usually indicated by the yellow foliage of the trees. Certain fungi are constantly associated with the diseased roots, and it is thought probable that they may be ultimately responsible for the destruction of the tree. Investigations showed, however, that much of the injury was due to overirrigation and lack of drainage of the soil.

The apple-tree rosette is reported from a number of orchards which were inspected by the author and numerous specimens secured. No parasitic organism of any kind could be discovered and the conclusion is reached that the nature of the soil was probably the primary cause of the disease. The orchards were planted in a soil which contained an excess of marl, in some places the substance forming a solid substratum. During the early part of the season water is plentiful but later the supply usually becomes exhausted. The soil rapidly dries out and the trees suffer from the lack of moisture, consequently the growth stops and the tissues harden. Later in the season the supply of water is restored and the orchard irrigated, with the result that in many instances distinct second growth is made which is immature when winter sets in, and the branches are either killed outright or severely injured. Second growth is not always necessary for the appearance of the disease, as was shown by examinations in a number of orchards. The soil is estimated to contain 1,820 lbs. of common salt per acre, taken to a depth of 1 ft. In addition, sodium carbonate is very abundant, and it is probable that these alkalis exert an injurious effect upon the trees. Attention should be paid to the nature of the soil where the orchards are planted, and irrigation water should be judiciously used to prevent the occurrence of the disease. A number of instances are cited in which the Ben Davis apple suffered severe injury due to applications of Bordeaux mixture. It is thought probable that it will be necessary to modify the formula commonly recommended for spraying trees of this variety.

The blackberry-root disease, due to *Rhizoctonia* sp., has proved quite destructive about the station. There appears to be no cure for the disease, and the destruction of all affected plants is recommended as a preventive measure.

The occurrence of the asparagus rust (*Puccinia asparagi*) is mentioned. Asters planted in the college campus are said to have been almost entirely destroyed by attacks of species of Fusarium. This fungus seems to have been present in the soil, and it is recommended that the beds be removed or the soil replaced with fresh earth.

The pea-root disease proved one of the most destructive of the diseases under investigation during the season reported upon. The author's attention was first called to it in September, 1900. During the following winter soil from infected fields was secured and greenhouse experiments conducted with it. Plants in the soil were nearly always attacked by fungi on the roots and stems below ground, and although attempts to cultivate the fungus artificially failed, the distinctive characteristics showed that it belonged to the genus Rhizoctonia. A potato disease due to *Rhizoctonia* sp. was under investigation at the same time, and inoculation experiments were undertaken with the potato organism. While the experiments did not prove conclusively that the Rhizoctonia disease of potatoes was the cause of the trouble with peas, the indications pointed strongly to this conclusion. For the prevention of the potato disease and the stinking smut of wheat treatment with corrosive sublimate or formalin solutions is recommended.

Report of the botanists, G. E. STONE and R. E. SMITH (*Massachusetts Sta. Rpt. 1901, pp. 57–85, figs. 3*).—During the season covered by the report a number of species of fungi affecting shade trees have been observed. Among these are the *Glœosporium nervisequum,* which caused the partial defoliation of the white oak throughout the State, *Glœosporium* sp. on maple and sycamore, *Dothidea ulmi* on elm, and *Cercospora microsora* on the European linden. The dying of cut-leaved birches was quite prominent in the eastern part of the State during the summer. The cause of the trouble was incidentally due to borers, but it is thought that the drought of the previous season was the primary cause of the trouble.

The chrysanthemum rust, which was first noticed in the State in 1896 and has since extended over a large portion of the United States, is considered at some length. The disease was most prevalent in 1897 and 1898, and during the past 3 years has shown a marked tendency to decrease. Various remedies have been tried by different growers, and the practice of inside culture during the summer has proved very beneficial in obtaining plants free from rust. Most growers now consider the chrysanthemum rust of little consequence, and, so far as the authors' observations go, the proper remedies lie in the judicious selection of healthy rust-free stock and inside cultivation.

The practice of desiccation, or drying of greenhouse soils by the aid of the heat of the summer sun, has been followed for some time to observe the effect of such treatment on certain organisms. The drop fungus of lettuce (*Sclerotinia* sp.) is greatly accelerated in its activity by such treatment. The resting spores of many other fungi are doubtless affected in the same way. With lettuce it has been repeatedly observed that such drying of soil results in a stunted growth, producing an abnormally colored and worthless crop. The texture of the plants is poor, the leaves being thick and tough and inclined to crinkle. As showing that this condition is brought about by desiccation alone, it is stated that wherever any drip from the roof fell upon the soil plants grown in such places were always normal, and distinctly sharp lines can be observed in the lettuce crop grown under such conditions. It is suggested that the soil in lettuce houses should not be allowed to become too dry during summer, but if this occurs the soil can be renovated by applying hot water or steam to it, as has been previously shown.

During the past season the growing of muskmelons was attended with considerable loss due to the melon blight caused by Alternaria and the anthracnose (*Colletotrichum lagenarium*) as well as the attacks of the downy mildew (*Plasmopara cubensis*). The Alternaria during the season was less abundant than previously, but the anthracnose was quite common. The downy mildew has been comparatively unknown up to the present time when it occurred upon muskmelons over widely extended areas. With the exception of the anthracnose, the chief troubles with melons occur about September 1 as the fruit begins to mature. As considerable success has been attained by spraying for the prevention of these diseases, the authors suggest thorough spraying throughout the season, beginning as early as July 1.

The stem rots of chrysanthemums, carnations, and asters are described at some length, the latter disease having already been noted (E. S. R., 13, p. 1060).

The asparagus rust continues to be a serious factor among the large growers of this vegetable. A large number of inquiries have been instituted in which the effects of dew, elevation, and shelter on infection were investigated. In no instance was the shelter produced by forest growth found to exert any beneficial influence; but there seemed to be considerable differences in the amount of the disease apparently attributable to the slope of the ground. It is possible that dew plays a part in asparagus rust infection in those regions where the conditions are favorable for an outbreak from the uredospore form of the fungus. Experiments in spraying were conducted, following the recommendations of the New York State Station (E. S. R., 13, p. 147). This method proved an expensive one and asparagus growers do not favor it. Fully as beneficial results were obtained by an application of Paris green. This method is a cheap one and is considered worthy of further trial.

The sterilization of soil in greenhouses for the prevention of fungus diseases has been under consideration at the station for a number of years. It has been recommended for the extermination of soil fungi such as Rhizoctonia, *Pythium debaryanum*, nematode worms, *Botrytis* sp., etc. During the past year the commercial use of this method has been greatly extended. The effect of sterilized soil on the growth of plants has been noted, and for the purpose of determining this factor 2 beds of equal size were selected, one of which was treated with hot water until the soil was soaked and showed an average temperature of 145° F. at a depth of 4 in. The seed was planted in boxes of earth which had been heated to 212° F. with steam. The other bed remained untreated, the only difference in the 2 lots being the hot-water treatment. These beds were planted to lettuce and the weight of the largest as well as the weight of typical plants showed a gain of 33 per cent in favor of the plants grown upon the treated soil. Various methods of sterilizing on a commercial scale are described at considerable length.

Notes on fungus diseases, H. H. Lamson (*New Hampshire Sta. Bul. 87, pp. 127-130*).—Brief descriptive notes are given, together with suggestions for the prevention of the peach-leaf curl, plum rot, peach rot, downy mildew of the grape, cucumber and muskmelon downy mildew, and apple-tree canker.

Studies in smut diseases of cereals and their prevention, C. VON TUBEUF (*Arb. K. Gesundheitsamte, Biol. Abt., 2 (1901), No. 2, pp. 179–349*).—A description is given of the principal smuts affecting cereals, and suggestions given for their prevention.

New species of Uredineæ, J. C. ARTHUR (*Bul. Torrey Bot. Club, 28 (1901), No. 12, pp. 661–666*).—The author describes a number of new forms of Uredineæ which have been sent him from various localities in the United States, the type specimens of which are retained in its herbarium. The species described are as follows: *Puccinia batesiana, P. epicampus, P. xylorrhizæ, P. vilis, P. panicularia, Æcidium boltoniæ, A. magnatum, A. anogræ, Peridermium ornamentale, Gymnosporangium nelsoni, Ræstelia nelsoni, R. fimbriata.*

A new disease of alfalfa, G. POLLACCI (*Separate from Atti Inst. Bot. Univ. Pavia, VII, pp. 6, pl. 1; abs. in Ztschr. Pflanzenkrank., 11 (1901), No. 4–5, pp. 285, 286*).—A disease of alfalfa is described which is said to be due to an undescribed fungus to which the author gives the name *Pleosphærulina briosiana*. This fungus forms ash-gray spots with brownish borders on the leaves. The spots increase and run together, finally destroying the leaves. In addition to alfalfa, it is reported as occurring on the related species (*Medicago falcata*).

Clover anthracnose, B. MEHNER (*Ztschr. Pflanzenkrank., 11 (1901), No. 4–5, pp. 193–196*).—During the summer of 1901 clover anthracnose was noted in a number of localities in Germany as affecting the red clover. The disease in some regions proved very destructive, 25 or 30 per cent and sometimes more of the plants being killed. The fungus which causes the disease was identified as *Glœosporium trifolii*. Investigations made on the disease seem to indicate that it spreads during the growing season by means of the conidia, and that it survives the winter as mycelium and in pycnidial form in the tissues of the clover plants. This disease is thought to have been introduced from America through clover seed, and is more destructive to plants grown from American than from German seed, the American being a more hairy plant, is more subject to disease.

Potato failures, F. M. ROLFS (*Colorado Sta. Bul. 70, pp. 20, pls. 12*).—Numerous inquiries had been received from potato growers regarding a failure of the crop, and investigations showed that the trouble was due to attacks of *Rhizoctonia solani* (E. S. R., 13, p. 55), which is an active parasite of the potato plant. The annual loss in the State from this disease is quite large, and it is reported as quite common in the potato fields of New York, Ohio, Iowa, Minnesota, Florida, Oklahoma, Texas, Colorado, California, and Washington. The effect of the fungus on the potato plants is described, one of the common results being the formation of an abnormal number of very small potatoes of no marketable value. The organism is peculiarly a soil fungus, and the disease may be transmitted through the use of infected seed. Inoculation experiments are reported in which the disease was readily produced. Examination of a lot of potatoes during the planting season showed that 91 per cent were more or less covered with sclerotia of the fungus. The disease may be carried not only by potatoes but also by beet roots, dead potato stems, or on the dead stems of many weeds which grow in potato fields. The results of seed treatment with corrosive sublimate and formalin solutions indicate that the diseased potatoes may be readily disinfected by such treatment, but in order to secure good results the treated seed must be planted in soil which is free from disease. When a field has become thoroughly infected with the disease the fungus will doubtless remain in the soil for a number of years. Attention should be paid to the sorting and disinfecting of the seed tubers, and by practicing a long and systematic rotation of crops the soil may be prevented from becoming badly infested with this fungus.

Study of a new bacterial disease of the potato, G. DELACROIX (*Compt. Rend. Acad. Sci. Paris, 133 (1901), No. 24, pp. 1030–1032*).—In a previous publication (E. S. R., 13, p. 1058) the author described a bacterial disease of potato which was then attributed to the organism which had been previously described as *Bacillus solanacearum*. Subsequent studies have led to the conclusion that the disease in question is not to be attributed to this organism but to another, apparently undescribed, to which the name *B. solanincola* is given. The effect upon the host and the action of the organism in various media are described. The author states that tomatoes are also affected by this organism, but that they are less susceptible than potatoes. The organism is believed to be present in the soil, from which it spreads to the plants, and unfavorable meteorological conditions are a contributive cause of the infection. Associated with it is frequently found the fungus *Rhizoctonia solani*, which proves quite destructive, and the mycelia of other fungi have also been isolated. Their presence is attributed, however, to the penetration of the plant by the bacteria.

Asparagus rust, W. T. MACOUN (*Canada Expt. Farms Rpts. 1901, pp. 110–112*).—The asparagus rust (*Puccinia asparagi*), which has been reported from a number of localities in the United States within the past 5 years, has made its appearance in Canada, being reported at the Central Experimental Farm for the first time during this season. The life history of the fungus and suggestions for its treatment are given, the statements being largely compiled from New York State Station Bulletin 188 (E. S. R., 13, p. 147).

Cantaloupe blight in 1901, H. H. GRIFFIN (*Colorado Sta. Bul. 68, pp. 12–14*).—In continuation of the investigations on this disease (E. S. R., 13, p. 362), work was planned in treating the seed with Bordeaux mixture, and in spraying to determine the time at which it is most efficient. The work attempted at the station grounds was destroyed by a hail storm the latter part of July. Sprayings at a number of localities reaffirmed the general efficiency of Bordeaux mixture. Two prominent features were brought out in the investigation, one of which was the necessity of avoiding the use of heating manures previous to planting melons, and the other the need of rotation of cantaloupes with other crops. Comparisons between fields planted the latter part of March and early in May showed that while the season was one of the most favorable for extremely early planting there was no advantage over planting a month later.

Nematodes as enemies of garden plants, A. OSTERWALDER (*Gartenflora, 50 (1901), No. 13, pp. 337–346, pl. 1, fig. 1*).—A description of nematodes, together with suggestions for their eradication are given.

Canker of apple trees, H. HASSELBRING (*Illinois Sta. Bul. 70, pp. 225–239, pls. 4*).—Descriptions are given of some of the fungi which cause diseases known as canker of fruit trees, and of a new canker disease, designated as the Illinois apple-tree canker, which is doing serious damage in the apple orchards of Illinois. This canker is caused by the fungus *Nummularia discreta*, which has long been known, and as a saprophyte has frequently been reported on various hosts in Europe and America, but hitherto has not been reported as a parasitic organism. The disease was first noticed in the apple-growing regions of southern Illinois during the past season. Within an infected orchard the disease is usually scattered, the infected trees occurring here and there. The canker wounds are usually formed on the larger limbs near the trunk of the tree, from which they extend upward on the limb, and frequently down into the trunk. The appearance of the canker varies with age. At first the spots are inconspicuous, so that they are readily overlooked by the casual observer. In the earliest stages the diseased bark has an unhealthy, dirty brown appearance, and is usually depressed a little below the living bark. The spots vary in size, sometimes attaining a diameter of 6 in. They grow most rapidly in the direction of the long axis of the limb. The interior of the spot has a mottled appearance, due to sound areas scattered here and there throughout the dead tissue. The boundary between the dead and sound bark is usually sharply marked, sometimes cracks appearing along the boundary. Often the wound is accompanied by a flow of sap, which is probably a secondary phenomenon not due to the parasite. Late in the summer or autumn the fruiting bodies of the fungus appear near the margin of the diseased spot. These are produced under the bark, which soon splits, forming star-shaped ruptures and exposing the pale grayish-yellow spore cushions, which are ⅛ to ¼ in. in diameter. As the canker spots increase in size they change in appearance, the bark in the older part becoming rough and blackened, as though charred. The entire blackened area is dotted over by these circular stomata, which form the most pronounced distinguishing feature of this disease. The injury which the fungus causes is first local, being restricted to the area of the canker spot; but the rapid advance of the mycelium along the longer axis of the limbs spreads the disease, so that branches may sometimes be diseased for a distance of 2 or 3 ft. before they are finally and completely girdled.

So far as the observations of the author go, the fungus is a wound parasite, and on this account care should be exercised not to injure the bark, and in pruning to cover wounds with paint or some fungicide. Badly diseased limbs should be cut and burned, and when first noticed the removal of the bark with a portion of the underlying tissue, and covering the wound with paint or Bordeaux mixture, is recommended.

Notes on spraying for bitter rot, J. T. Stinson (*Missouri Fruit Sta. Bul. 2, pp. 20, figs. 4*).—Suggestions are given for the spraying of apple trees, and the time of application, formulas for use, and machinery are described. A report is also given on experiments in the prevention of bitter rot of apples. The trees were sprayed with Bordeaux mixture, the foliage and fruit being well covered with the fungicide during July and August. In every case the amount of marketable fruit from the sprayed trees equaled or exceeded that from the unsprayed, but the fruit from the unsprayed trees was the more highly colored. The investigations showed that Bordeaux mixture as used was injurious to some varieties, particularly the Ben Davis.

Brown rot of peaches and plums, C. C. Newman (*South Carolina Sta. Bul. 69, pp. 12, figs. 3*).—It is said that the peach crop has proved an almost total failure in many sections of the State, due to the attacks of the fungus *Monilia fructigena*. The fungus is popularly described, and for its prevention spraying with Bordeaux mixture is recommended. A formula is given for Bordeaux mixture; and the cost of 4 applications for 6-year-old trees is estimated at 6 cts. per tree, or for 10-year-old trees about 12 cts. per tree. The importance is pointed out of destroying the decayed fruits in order that the fungus should not be carried over the winter. A tabular statement is given showing the results of spraying 60 varieties of peaches. All of the early varieties received 3 applications, the later ones 4 and 5, and the very late-ripening 6 sprayings. As a result of the spraying the amount of sound fruit is said to have been increased by from 25 to 75 per cent.

A new disease of orange, T. Ferraris (*Separate from Malpighia, XIII, pp. 14, pl. 1; abs. in Ztschr. Pflanzenkrank., 11 (1901), No. 4–5, pp. 291, 292*).—An account is given of a rot of the orange fruit which is due to *Oidium citri-aurantii*, n. sp., which is described. Pure cultures of it were grown on agar containing orange juice, and from these cultures sound oranges were inoculated, producing the disease.

Coffee diseases in Brazil, F. Noack (*Ztschr. Pflanzenkrank., 11 (1901), No. 4–5, pp. 196–203, pl. 1*).—The author describes at considerable length some of the more destructive diseases of coffee which have been observed upon the coffee trees in Brazil. Those described are due to the fungi *Cercospora coffeicola*, *Mycosphærella coffeæ*, and *Colletotrichum coffeanum*, the latter two being described as new species. The different fungi are described in detail and the effect produced upon the host plants is shown. While originally reported from Brazil, these fungi are known from other localities.

On the use of potassium permanganate against oidium, B. CHAUZIT (*Rev. Vit., 16 (1901), No. 416, p. 631*).—An account is given of the successful use of a 2 per cent solution of potassium permanganate in protecting 2 exceptionally susceptible varieties of table grapes against attacks of oidium. The question of the probable presence of the permaganate in wines made from grapes treated with this solution has been raised, and the author shows that it is hardly probable that any of the fungicide will find its way into the wine.

A new factor in combating mildews, F. W. NEGER (*Ztschr. Pflanzenkrank., 11 (1901), No. 4–5, pp. 207–212*).—In combating the powdery mildews the author calls attention to the necessity of ascertaining the form in which the fungus passes the winter and mode of distribution of the spores, grouping the different powdery mildews into two classes based upon this factor.

Life history and means for detection of timber rot fungi and similar organisms, G. MARPMANN (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 22, pp. 775–782*).—Notes are given on *Merulius lacrymans, Polyporus* spp., *Trametes radiciperda, Agaricus melleus*, etc.

A fungus disease of juniper, A. VON JACZEWSKI (*Ztschr. Pflanzenkrank., 11 (1901), No. 4–5, pp. 203–207, figs. 7*).—A description is given of a disease of junipers caused by *Exosporium juniperinum.* This fungus has been previously described under the name *Coryneum juniperinum.* Subsequent to this description it was given the name *Exosporium deflectans*, and as the fungus belongs to the latter genus the author has made the transformation of the specific name to conform with the recent laws of botanical nomenclature. In addition to this fungus, the author reports the occurrence of another (*Hendersonia notha*) as sometimes occurring, as well as a second species (*H. foliicola*).

Studies on Æcidium elatinum, E. FISCHER (*Ztschr. Pflanzenkrank., 11 (1901), No. 6, pp. 321–343, figs. 4*).—This fungus, which is said to cause the hexenbesens on silver fir, has been studied by the author and its uredo and teleutospore forms determined. The uredo and teleuto forms are reported as having been found upon various species of Cerastium and Stellaria. The inoculation experiments are reported on a large number of species of plants representing widely varying orders of plants. Experiments are also reported on the production of hexenbesens from material obtained from species of Stellaria, etc.

The poplar rust, J. FLETCHER (*Canada Expt. Farms Rpts. 1901, pp. 259–261*).—The poplar trees of the Northwest Territories (*Populus tremuloides*) are reported as badly affected by the fungus *Melampsora populina*, and as a result of the attacks the trees are frequently defoliated. A similar fungus is reported on the birch foliage. Most of the young seedlings planted in this region are imported from Minnesota and Dakota, and it is noted that those varieties of poplar which have been imported from Russia have so far escaped the attacks of the fungus. If they should continue to show this immunity their importance for tree planting in the West would be greatly increased.

Maple seed blight, J. FLETCHER (*Canada Expt. Farms Rpts. 1901, p. 259*).—During the summer of 1901, at Indian Head and the surrounding district, the seed of the ash-leaved maple (*Negundo aceroides*) were found seriously attacked by a fungus which proved to be a species of Fusarium. When trees are affected by this disease the seed show the injury, the edges of the wing becoming bleached and spotted, and the seeds fail to fill. The importance of the ash-leaved maple as a shade tree in the West can scarcely be overestimated, and should this disease persist it would be necessary to grow seedlings from seed obtained from localities which are not infested.

The action of copper on leaves, S. M. BAIN (*Tennessee Sta. Bul., Vol. XV, No. 2, pp. 21–108, pls. 8, fig. 1*).—This bulletin gives the results of investigations begun in 1895 and continued with some interruption until 1901, a preliminary account of which has already been given (E. S. R., 13, p. 866). The object of the experiments was to ascertain the effect of fungicides on peach foliage, which might be of economic value in the treatment of the diseases of that plant. Comparative studies were made on the effect of fungicides on apple and grape. The poisonous action of copper solutions introduced through the roots, the action on the leaves and conditions affecting the action, the permeability of the cuticle of the leaf and its relation to the action of fungicides, wound healing of the leaves and leaf fall, and the influence of copper on the assimilative function of leaves are all discussed at considerable length.

From the evidence presented there appears to be little doubt that copper is absorbed by the leaves of plants sprayed with Bordeaux mixture. The conclusive and final evidence of the entrance of copper into the tissues of the leaf is a subject for future investigation. One of the first conditions permitting the absorption of any substance by the leaf is that the substance shall be either a liquid or dissolved in a liquid. The injury to peach foliage caused by copper is the same whether supplied in the form of a soluble salt or an insoluble hydrate. There appears to be some substance escaping from the peach leaf which has a solvent action on copper hydroxid, but the nature of this substance is as yet not known. It is shown that while peach leaves are able to dissolve copper hydrate, the presence of lime has a tendency to prevent this solvent action and retards or wholly prevents the injury of copper to the leaves. One of the most important features in this connection is the solubility of copper applied to the leaves. Attention is called to the action of the so-called strong and weak Bordeaux mixtures. If properly made, these differ only in the amount of copper hydrate deposited upon the leaves. An excess of lime in Bordeaux mixture has a tendency to retard the rate of the entrance of copper into the leaf by simply preventing the copper from passing into solution. Another important factor controlling the entrance of copper into the leaf is the presence of water. It is shown by the author's experiments that no injurious effect follows the spraying of peach leaves, providing they are not exposed to rain or dew. Another factor to be considered is the rate of entrance of the copper into the leaf through the permeability of the leaf cuticle.

Summing up his investigations, the author concludes that peach foliage is very susceptible to injury by fungicides because the leaves are especially sensitive to poisons in general and to copper in particular. Peach leaves have the power, which may or may not be possessed by other leaves, of dissolving copper hydroxid. They have a cuticle which is thinner and more permeable than many other leaves, and the glandular surfaces terminating their marginal teeth are especially fitted for the absorption of copper in solution by reason of their thin cuticular covering. Peach leaves are especially sensitive to the various agencies producing leaf fall by the production of a normal abscissal layer. They have the power, in common with other leaves of the same genus, to exfoliate any injured region, and this involves much more than the really injured cells. If this process removes a large portion of the lamina, the whole leaf falls. As a practical suggestion for the prevention of injury the author recommends the spraying of leaves with a thin solution of milk of lime about 2 days in advance of the spraying with Bordeaux mixture. This will offer considerable protection to the leaves against the injurious action of the copper, and the Bordeaux mixture lying above the stratum of calcium carbonate can act upon any fungus spores coming in contact with it. An extensive bibliography on the subject concludes the bulletin.

Some recent work with fungicides by the experiment station, A. D. SELBY (*Proc. Columbus Hort. Soc., 16 (1901), pp. 134–136*).—A report is given of experiments conducted by the Ohio station on spraying a vineyard and on treating onions for the prevention of disease. The vineyard received 7 applications of fungicides, the first 4 of Bordeaux mixture and the last 3 of ammoniacal copper carbonate. These were applied at a cost of about $6.50 per acre. The fruit produced on the unsprayed tract was of an inferior quality and sold at the rate of about $6 per acre. The sprayed tract gave a gross return of $122 per acre. When soda-Bordeaux mixture was used to follow the ordinary Bordeaux, an increase of $18 per acre over the above sum was noted.

Experiments with onion smut treatment consisted of the application of ground lime to the soil just before seeding the onions and the sprinkling of a solution of formalin on the scattered seed. The results obtained show that either of the two methods is a better remedy than any heretofore used for onion smut prevention in infected soils.

The solubility of a mixture of copper and sodium sulphates, Massol and Maldes (*Compt. Rend. Acad. Sci. Paris, 133 (1901), No. 5, pp. 287–289*).—The solubility of copper and sodium sulphates when mixed in varying proportions has been determined. It was found that at different temperatures the different compounds vary in their strength of solution. At comparatively low temperatures there is ordinarily little variation in the composition of the solution, but if the temperature be raised to from 23 to 33° C. the composition of the solution will vary in proportion to the relative amount of the 2 salts in the mixture.

ENTOMOLOGY.

Some insects injurious to vegetable crops, F. H. Chittenden (*U. S. Dept. Agr., Division of Entomology Bul. 33, n. ser., pp. 117, figs. 30*).—The author presents descriptive, biological, and economic notes on a large number of insects injurious to various garden crops. Brief mention may be made of the following species which are discussed by the author:

Potato stalk weevil (*Trichobaris trinotata*) (pp. 9–18).—This insect is distributed on the north to Pennsylvania, New Jersey, Illinois, Iowa, and even into Canada; in the South the insect is found as far as Florida and Texas. The beetles were seen in the District of Columbia as early as May 20. The pupal stage is said to vary from 8 to 11 days. All the beetles mature by September and hibernation takes place in the adult stage. The insect is attacked by *Siglaphus curculionis.* The best remedy for this insect consists in pulling up infested vines as soon as they begin to wilt and destroying all vines in the field as soon as the crop is harvested. All solanaceous weeds in the neighborhood of the potato patch should also be burned.

The northern leaf-footed plant bug (*Leptoglossus oppositus*) (pp. 18–25).—The species of this genus live in all of their stages preferably upon the fruit of the plants which they attack. There is but one generation per annum of this species. The fruit plants are usually cucurbits, but hibernated adults may appear on fruit trees in the spring. The insect is attacked by *Trichopoda pennipes.* The best remedies are hand picking, capturing in inverted umbrellas or nets saturated with kerosene, and free use of kerosene emulsion.

The carrot rust fly (*Psila rosæ*) (pp. 26–32).—This pest caused much damage in a celery field in New York during 1901. The insect occurs in England, continental Europe, and has been for some years known to be an injurious species in Canada. The life history of the carrot rust fly has not been carefully worked out. It is attacked by *Alysia apii.* The best methods of control are the use of kerosene emulsion, late sowing, rotation of crops, destruction of insects in stored carrots, and direct treatment of the insect in celery beds.

The carrot beetle (*Ligyrus gibbosus*) (pp. 32–37).—This insect is described and notes are given on its habits and life history. It is distributed from Long Island to California, and in the Gulf States. It is perhaps the most injurious species of carrot insect in this country. The knowledge of the life history of the insect is still incomplete. Some larval injury has been noted, but the larvæ frequently feed on humus, manure, and decomposing roots. The species is single brooded. One species of bird, chuck-will's-widow, is reported as feeding on the beetles in the adult stage. The best remedy for this insect consists in the use of lantern traps and scattering lime through infested fields.

The beet army worm (*Laphygma exigua*) (pp. 37–46).—This species is evidently of foreign origin, and has gradually spread from California eastward into the eastern portion of Colorado on the Atlantic side of the Continental Divide. It was first reported as injurious by C. P. Gillette, in Colorado, and has subsequently been noted as quite injurious in that State. Sugar beet is its favorite food plant, but the insect also feeds upon lamb's quarters, pigweed, corn, potato, peas, onions, etc. The caterpillar is sometimes parasitized by *Frontina archippivora*. The best methods of fighting this insect are by means of Paris green and kerosene emulsion. Brief notes are given on garden webworms (pp. 46–49). The species considered are *Loxostege similalis*, *L. sticticalis*, and *Hellula undalis*.

The red turnip beetle (*Entomoscelis adonidis*) (pp. 49–53).—This species is said to be common to North America, Europe, and Asia, and to be generally distributed over these countries. The eggs are usually laid in the autumn and the species hibernates in the egg stage. The red turnip beetle may be destroyed by the remedies which are commonly used against Colorado potato beetle.

The cross-striped cabbage worm (*Pionea rimosalis*) (pp. 54–59).—This species agrees very closely in its life history with the imported cabbage butterfly. A number of parasitic insects of the genus Apanteles have been bred from it. The best remedy is perhaps Paris green applied dry or as a spray. Other remedies may be tried, such as bran mash, kerosene emulsion, pyrethrum, mechanical methods, clean cultivation, trap crops, and spraying with water.

The cabbage looper (*Plusia brassicæ*) (pp. 60–69).—This species usually feeds on Cruciferæ, but also attacks asparagus, clover, and various greenhouse plants. It is parasitized by 1 or 2 species of insects, and is preyed upon by black and white spiders. A number of larvæ were found apparently suffering from a bacterial disease which was not determined. A fungus disease (*Botrytis rileyi*) sometimes causes the death of the larvæ. The artificial remedies may be the same as those recommended for cross-striped cabbage worm. *A new cabbage looper* (*P. precationis*) (pp. 69–72), was observed attacking cabbage and other garden plants in the District of Columbia in 1900. The moth is generally distributed east of the Rocky Mountains. The best remedy for this species is probably Paris green.

The celery looper (*Plusia simplex*) (pp. 73, 74).—This species appears throughout the season in a large number of localities east of the Rocky Mountains. It may be destroyed by the use of Paris green.

Notes on Dipterous leaf miners on cabbage (pp. 75–77).—A brief account is given of the feeding habits and life history of *Scaptomyza flaveola*, *S. adusta*, *S. graminum*, and *Agromyza diminuta*.

Notes are given on a considerable number of insects injurious to cabbage, especially late cabbage, and similar crops (pp. 77–84). The species discussed in this section are *Phyllotreta bipustulata*, *Ceutorhynchus rapæ*, *C. quadridens*, wasps as destroyers of cabbage worms, cabbage-root maggot injurious to celery, cabbage-plant louse, diamond-back moth, harlequin cabbage bug, imported cabbage butterfly, and cabbage looper. The desirability of keeping up applications of insecticides late in the fall is urged upon gardeners.

Notes on insects injurious to peas and beans are presented on pages 84–110. The species upon which notes are given include *Phorbia fusciceps*, which attacks the seeds and sprouting plants of various kinds of beans and corn, and which may be checked by placing sand soaked in kerosene around the seed when planted; *Eudamus proteus*, which is apparently injurious only in Florida and a few other Southern States and may be controlled by spraying with Paris green; *Semasia nigricana*, the injuries of which may be partly controlled by planting very early and late varieties of peas, by clean culture, and early fall plowing. *Ogdoconta cinereola*, which injures the foliage and pods of beans, is distributed generally east of the Rocky Mountains, has no parasitic or predaceous enemies, and may be best controlled by spraying with arsenate of lead; *Uranotes melinus*, *Cerotoma trifurcata*, *Monoptilota nubilella*, *Diabrotica atripennis*, *Spermophagus pectoralis*, pea weevil, bollworm, fall webworm, *Halticus uhleri*, *Acanthocerus galeator*, *Alydus eurinus*, leaf hopper, *Aphis rumicis*, and wireworms.

Notes are also given on a number of flea-beetles (pp. 110, 117), including the following species: *Systena blanda*, *S. frontalis*, *S. hudsonias*, *Chætocnema denticulata*, *C. pulicaria*, *Disonycha xanthomelæna*, and *Epitrix fuscula*.

Proceedings of the Entomological Society of Washington (*Proc. Ent. Soc. Washington, 5 (1902), No. 1, pp. 92, pl. 1, figs. 2*).—In this number of the proceedings various articles on entomological subjects are contained. A considerable proportion of the articles are given in abstract and are reprinted elsewhere. The papers read at the various meetings of the Society include the following:

Some Insects from the Summit of Pikes Peak, Found on Snow, by A. N. Caudell; Evolutionary Inferences from the Diplopoda, by O. F. Cook; A Review of the Species of Haploa, A New Form of Clisiocampa from Colorado, A Lepidopterous Larva on Leafhopper, Illustrations of the Early Stages of some Diptera, and The Collection of Lepidoptera in the National Museum, by H. G. Dyar; Hemiptera from the Summit of Pikes Peak, Found on Snow, by O. Heidemann; Some Notes on the Genus Dendroctonus, and A New Genus of Scolytids from Florida, A. D. Hopkins; Notes upon the Structure and Classification of Chrysomelid Larvæ, E. D. Sanderson; Notes on the Life History of the Codling Moth, C. B. Simpson; and The Cattle Ticks of North America, C. W. Stiles.

Thirty-second annual report of the Entomological Society of Ontario, 1901 (*Rpt. Ontario Ent. Soc. 1901, pp. 128, pls. 2, figs. 58*).—This report contains the proceedings of the thirty-eighth annual meeting of the Entomological Society of Ontario, held in London, November 13 and 14, 1901, and the proceedings of the third annual meeting of the Northwest Entomological Society, held in Lacombe, Alberta, Northwest Territory, November 9, 1901.

A discussion of the San José scale problem (pp. 3–12) was had, in connection with an address by J. Fletcher on the San José scale in Ohio and Ontario. The 3 remedies which were considered practicable and effective were crude petroleum, whale-oil soap, and hydrocyanic-acid gas.

The importance of entomological studies to the community at large was discussed by T. W. Fyles (pp. 13–21). In this paper the extent of damages from injurious insects is briefly mentioned and notes are given on the economic importance of a general knowledge of the habits of insects.

Brief notes are given on the insects of the year by C. H. Young, J. D. Evans, and J. Johnston (pp. 24–28). This discussion embraces short notes on white cabbage butterfly, birch bucculatrix, cankerworms, Hessian fly, potato beetle, and asparagus beetle. The injurious insects of the season of 1901 are reported upon by W. Lochhead (pp. 43–50). The author gives notes on the habits and life history of codling moth, potato-stalk borer, asparagus beetle, blister beetle, currant aphis, cherry aphis, snowy tree cricket, raspberry cane maggot, rose chafer and oak pruner. Notes on the season of 1901 are given by J. A. Moffat (pp. 50–53), including a brief account of the turnus and archippus butterflies and *Euphoria inda*. The habits and life history of the painted butterfly (*Pyrameis cardui*) are discussed by J. Fletcher (pp. 54–56).

North American fall webworms, H. H. Lyman (pp. 57-62). The author gives short notes on the habits and life history of a number of species of Hyphantria, with tables indicating the months in which they appear in various stages and in which they are most injurious.

The trend of insect diffusion in North America is discussed by F. M. Webster (pp. 63–67). A map is presented showing the general directions of the movements of insects in different parts of the country at the present time. The same author (pp. 67–74) also read papers on the imported willow and poplar curculio and on the common cheese mite, which is reported as living in cultures of *Sporotrichum globuliferum*.

The hibernation of insects, W. Lochhead (pp. 74–78). Lists were compiled by the author of insects which hibernate in larval, pupal, adult, and egg conditions.

A paper was read by J. A. Moffat on the archippus butterfly (pp. 78–82), in which evidence was presented to show that this butterfly does not hibernate in the adult form and that the peculiar collections of this species, which are sometimes observed in autumn on bushes or trees in Northern altitudes, are also seen in the South, where the purpose of this collection is not hibernation.

The following papers were also presented at this meeting: Collecting at Light in 1901, J. D. Evans (p. 82); The Milkweed at Dusk, A. F. Winn (pp. 82–84); A Collecting Trip in Southwestern Ontario, by E. M. Walker (pp. 85–90); Crickets, by T. W. Fyles (pp. 90–94); Nature Study Lessons on Mosquitoes, by W. Lochhead (pp. 94–98); Entomological Record for 1901, by J. Fletcher (pp. 99–108); Commercial Entomology, by C. Stevenson (pp. 113–115); and The Food of the Grass Snake (*Liopeltis vernalis*), by J. B. Williams (p. 115).

At the third annual meeting of the Northwest Entomological Society the president of the Society, in his annual address, presented short notes on a number of injurious insects, including cabbage butterfly, tent caterpillars, crane flies, horse botfly, and Colorado potato beetle.

Biographical notes of Eleanor A. Ormerod and O. Luggar are also presented.

Report of the entomologist, J. FLETCHER (*Canada Expt. Farms Rpts. 1901, pp. 196–252, figs. 18*).—The author gives brief descriptive notes on the conditions found in various parts of Canada during a trip of inspection. The insects which were most injurious to cereals during the year were grain aphis, wheat-stem maggot, Hessian fly, cutworms, and grasshoppers. The ravages of the Hessian fly on winter wheat in Ontario were more serious than they had been for many years; barley also suffered considerably in a number of localities. Notes are given on the extent and seriousness of the attacks of the Hessian fly in different parts of Canada, as reported by various farmers and voluntary observers. The time to sow winter wheat so as to avoid as far as possible the attacks of the Hessian fly can not be fixed for all years, but must be regulated according to the season rather than the almanac. Apparently it is not safe to sow wheat in the counties bordering on Lake Erie before September 15. During the year the most widespread and disastrous outbreak of cutworms which had ever been reported for Manitoba occurred in various parts of this Province. The cutworm chiefly concerned in this injury was *Carneades ochrogaster*. Similar injuries were caused to grain in Ottawa by *Hadena devastatrix*. Various kinds of grain were eaten down to the surface of the ground, or in some cases cut off beneath the surface. The poisoned bran remedy is recommended for future outbreaks of this sort. Locusts of various species also caused considerable loss, especially in central Manitoba and British Columbia. The species concerned were chiefly *Melanoplus atlanis*, *M. packardii*, *M. bivittatus*, and *Camnula pellucida*. One of the most successful remedies in combating these insects was found in the use of a poisoned bait consisting of fresh horse manure, salt, and Paris green. The locusts were easily attracted to this bait, and when it was scattered around the edge of grain fields and thrown into the fields to a distance of 20 or 30 ft., it was found that the attack of the locusts was very materially checked. The use of horse dung for this purpose in the place of bran has the advantage of cheapness.

Notes are given on a number of insects which were injurious to some extent upon root crops and garden vegetables. The species of insects chiefly concerned in these attacks were cabbage aphis, cabbage worm, variegated cutworm, and other species of cutworm, cabbage-root maggot, asparagus beetle, zebra caterpillar, squash bug, and striped cucumber beetle. Brief notes are given on the habits and life history of the species and the usual remedies are recommended for combating them.

The insects which were most injurious to potatoes were striped blister beetle, cucumber flea-beetle, tomato worm, potato-stalk weevil, and variable cutworm (*Mamestra atlantica*). The striped blister beetle was injurious to potatoes, tomatoes, mangel-wurzels, beets, and other garden crops. It is suggested that it may be easily destroyed by spraying with Paris green, but that this measure should not be adopted except where it is necessary, since the larvæ of the beetle are beneficial in destroying the eggs of grasshoppers. The potato-stalk weevil has not previously occurred in Canada in sufficient numbers to cause any serious damage to potatoes. It is recommended that all infested vines should be destroyed as soon as the potato crop is harvested. Observations on the variable cutworm indicate that this species may possibly be double brooded at Ottawa, since moths were captured as early as May 22 and as late as August 25.

A number of fruit insects are dissussed in this report, including codling moth, oyster-shell bark-louse, cankerworm, tent caterpillar, apple-tree borer, rose chafer, wireworm, San José scale, *Colaspis brunnea*, *Lecanium fitchii*, *Cecidoptes pruni*, and *Phlœotribus liminaris*. *L. fitchii* caused a great amount of damage to blackberries near Trenton, Ontario, where about 8 acres of this fruit were found covered with scales from about a foot above ground to the top of the canes. The injury was chiefly done to the old plantations. *C. pruni* is reported as causing galls of small size on the young twigs, usually on old trees, They were found very abundantly during the year at one orchard in Queenstown. The San José scale is still a very important fruit tree pest; it occurs in no other province of Canada except Ontario. Notes are given on the rapidity of increase and the nature of damage done by this species. It is stated that the Federal San José Scale Act has been rigidly enforced, with good results. The three remedies which are recommended for the San José scale as especially effective in Canada are whale-oil soap, crude petroleum, and hydrocyanic-acid gas. Crude petroleum proved very effective on peach trees, in a 15 per cent mechanical mixture with water, and no injury was done to the trees. G. E. Fisher carried out some successful experiments in fumigating small fruits and young trees in an inverted barrel. Brief notes are given on two species of insects injurious to forest trees, viz, birch skeletonizer (*Bucculatrix canadensisella*) and *Semiophora youngii*. The latter species was observed attacking American larch and black spruce, and was described by J. B. Smith as a new species. The moths appear at the end of August and the early part of September.

Entomological notes, J. A. ORTIZ (*Bol. Ofic. Agr. Ganadera, 2 (1902), Jan., pp. 408–415, figs. 5*).—Brief notes on pea weevil, *Eumolpus vitis*, fruit-tree bark beetle, Colorado potato beetle, and *Lytta otomaria*.

Injurious insects, J. C. CHAPAIS (*Nat. Canad., 29 (1902), No. 5, pp. 65–70*).—Brief notes are given on the habits and life history of the grain weevil, rice weevil, and raspberry sawfly. The usual remedies are recommended for combating these insects.

Some insects which are injurious in springtime, H. FAES (*Chron. Agr. Canton Vaud, 15 (1902), No. 7, pp. 189–195, figs. 2*).—Brief notes are given on the habits and life history of *Anthonomus pomorum*, *Hyponomeuta malinella*, and other injurious fruit insects of less importance.

Notes on entomology, A. Lehmann (*Dept. Agr. Mysore State Bul. 1, 1902, pp. 8*).—Brief general notes on the habits and life history of injurious insects. Directions are given for collecting specimens and sending them to the department.

Modern methods of studying and dealing with horticultural insect pests, J. B. Smith (*Proc. New Jersey State Hort. Soc., 27 (1902), pp. 65–75, pls. 2*).—The author gives a brief popular account of the progress of economic entomology with reference to horticultural insects, and of various means which have been adopted for controlling injurious insects by artificial and natural agencies.

Insects and insecticides, C. P. Gillette (*Colorado Sta. Bul. 71, pp. 40, figs. 27*).—This bulletin contains a general account of the more important injurious insects in Colorado and of the remedies which have been found most effective in combating them. Notes are given on the insects injurious to the apple, pear, plum, cherry, peach, grape, currant, and strawberry.

The more important insects injurious to wheat in Missouri, J. M. Stedman (*Missouri State Bd. Agr. Rpt. 1902, pp. 55–141, figs. 42*).—Notes are given on the distribution, habits, life history, and injuries caused by chinch bug, Hessian fly, wheat-bulb worm, wheat-straw worm, army worm, fall army worm, wheat-head army worm, *Feltia subgothica*, *Peridroma saucia*, *Agriotes mancus*, crane fly, wheat plant louse, Angoumois grain moth, and grain weevil. The article constitutes a sort of compendium of popular information concerning the most important insects in Missouri which are injurious to wheat.

Orchard enemies in the Pacific Northwest, C. V. Piper (*U. S. Dept. Agr., Farmers' Bul. 153, pp. 39, fig. 1*).—The Northwestern Pacific region is divided, from a horticultural standpoint, into coast region, inland valleys, and inland uplands. Brief notes are given on the conditions which affect orchards in the coast region, and on the more common insect and fungus enemies of apple, pear, cherry, plum, and prune. In the inland valleys the chief enemies to horticulturists are said to be San José scale, codling moth, plant lice, peach-twig borer, peach mildew, and pear blight. In the inland uplands the chief enemies are codling moth, San José scale, pear blight, and apple scale. Notes are given on the value and method of preparation of lime, sulphur, and salt wash; kerosene emulsion; Paris green; London purple; arsenic and lime; arsenic, soda, and lime; whale-oil soap and quassia; Bordeaux mixture; and ammoniacal solution of copper carbonate. A special discussion is given to San José scale, codling moth, peach-twig borer, western pulvinaria, woolly aphis, peach-leaf blister-mite, black spot apple canker, apple scab, pear scab, brown rot, pear blight, and crown gall.

Principal insects liable to be distributed on nursery stock, N. Banks (*U. S. Dept. Agr., Division of Entomology Bul. 34, n. ser., pp. 46, figs. 43*).—This bulletin is in response to a resolution passed by the official horticultural inspectors for the United States requesting this Department to prepare and publish a bulletin treating of insects injurious to nursery stock. The species which are discussed in the bulletin include peach lecanium, oyster-shell bark-louse, scurvy bark louse, San José scale, Putnam's scale, cherry scale, walnut scale, greedy scale, grape scale, peach scale, rose scale, woolly apple aphis, black peach aphis, apple plant lice, plum plant louse, cherry aphis, pear-tree psylla, buffalo tree-hopper, apple-tree tent caterpillar, fall webworm, brown-tail moth, leaf crumpler, white-marked tussock moth, gypsy moth, cankerworms, peach-tree borer, peach-twig borer, bagworm, round-headed apple-tree borer, flat-headed apple-tree borer, sinuate pear borer, fruit-tree bark beetle, apple-twig borer, pear-leaf blister mite, codling moth, apple maggot, cherry fruit fly, plum curculio, quince curculio, pear midge, and other less important species.

Treatment for San José scale in orchard and nursery, J. B. Smith (*Pennsylvania Dept. Agr. Bul. 90, pp. 33, pls. 2, figs. 5*).—A general discussion is presented of the problems connected with the injurious action of this insect, including its history in California, introduction and spread in the Eastern United States, life history, food plants, injurious effects, natural methods of dissemination, natural enemies, summer treatments, winter treatments, lime-salt-and-sulphur wash, whale-oil soap, kerosene, crude petroleum, insecticide machinery, and fumigation with hydrocyanic-acid gas.

Experiments with lime mixtures for the eradication of the oyster-shell bark-louse, W. T. Macoun (*Canada Expt. Farms Rpts. 1901, pp. 109, 110*).—Experiments were made in spraying with lime mixed with water at the rate of 1 or 2 lbs. to the gallon of water. It was found as the result of experiments during several years that lime slaked in water and sprayed upon apple trees has the effect of loosening the scales. For this purpose it should preferably be applied to the trees soon after the leaves fall in autumn, so that the rain and wind may have their full effect in removing the loosened scales. The lime apparently does not destroy the eggs under the scales, nor is it injurious to either peach or apple trees.

Treatment for the oyster-shell bark-louse, W. S. Blair (*Canada Expt. Farms Rpts. 1901, pp. 379, 380*).—Spraying with lime slaked in water at the rate of 1 or 2 lbs. to the gallon of water was found a cheap and effective remedy for this insect. The use of kerosene emulsion for destroying the young lice soon after they hatch was found to be fairly effective, but no trees were entirely freed from the pest. Tobacco water as a remedy for the oyster-shell bark-louse was tried on 5 trees and was found to be of little value. Not more than 10 per cent of the insects were killed by this treatment.

Arsenical sprays for the codling moth (*Jour. Agr. and Ind., South Australia, 5 (1902), No. 9, pp. 745, 746*).—Brief notes on the successful use of various arsenical insecticides, especially arsenite of soda, in destroying the codling moth.

Chemistry of insecticides and fungicides, F. T. Shutt (*Canada Expt. Farms Rpts. 1901, pp. 191–193*).—Analyses of various brands of lye and gas lime are reported, together with notes on insecticide mixtures which were proposed by correspondents. The different brands of lye were found to vary in the amount of chlorid of soda which they contained, and nearly all of them contained some impurities, such as sulphates and oxids of iron and aluminum. These impurities, however, are not considered as interfering with the efficiency of the lye. In the use of gas lime it was recommended that care be exercised not to apply this substance when it is too fresh, since it may then be injurious to vegetation. It is recommended to fruit raisers that no attempt be made to use mixtures of lime wash and soft soap, since a curdy lime soap is precipitated which is perhaps not so effective as soap alone. Whale-oil soap is considered rather more effective than soft soap, partly on account of its deterrent properties. While no experiments have been made to determine whether sal soda can be used with Paris green in the place of lime, the author believes that there is no reason why this substance can not be used to replace lime, but does not think it would be any more effective than lime.

A new emulsion for spraying, J. D. Ormsby (*Jour. Jamaica Agr. Soc., 6 (1902), No. 1, p. 11*).—The author had unsatisfactory results from the use of kerosene emulsion and prepared an insecticide containing 1 lb. hard soap, 1 qt. castor oil, ¼ lb. carbonate of soda, 1 gal. water. The soap and acid were boiled in water and mixed with the castor oil while heated; the mixture was then diluted with 10 to 20 per cent of water for spraying.

Carbolic emulsion, J. D. Ormsby (*Jour. Jamaica Agr. Soc., 6 (1902), No. 4, p. 145*).—For combating scale insects the author had good results from using an insecticide prepared as follows: 10 qt. boiling water, 1 qt. carbolic acid, 1 qt. soft soap. The mixture is stirred until an emulsion is formed and is applied by means of a brush.

The use of an acetylene gas lamp for the destruction of insects, R. Roger (*Rev. Hort., 74 (1902), No. 8, pp. 188–191, figs. 3*).—The author gives a brief account of the practical experiments which have been made in the use of a lantern trap lighted by acetylene gas for catching various species of insects. It is stated that this device may be successfully used in the destruction of insects in vineyards, gardens, storehouses, and other locations wherever the lamp can be operated.

How insects affect health in rural districts, L. O. Howard (*U. S. Dept Agr., Farmers' Bul. 155, pp. 20, figs. 16*).—The author discusses in a popular manner the agency of mosquitoes in carrying malaria and yellow fever and the relation between flies and typhoid fever and other diseases which may be carried under certain circumstances by flies and other insects, such as bedbugs, fleas, ticks, etc.

The house fly, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 20 (1902), No. 3, pp. 185–194, figs. 2*).—The author describes in detail the life history, habits, breeding season, and breeding places of the common house fly, and presents notes on the agency of this insect in carrying infectious diseases. The author recommends the usual approved remedies in combating this insect.

The humblebee, A. Gale (*Agr. Gaz. New South Wales, 13 (1902), No. 1, pp. 22–24*).—A brief description of the habits and life history of this insect. Attempts thus far made to introduce the species into New South Wales have been unsuccessful.

The apiary, J. Fixter (*Canada Expt. Farms Rpts. 1901, pp. 252–259, fig. 1*).—The average returns from the apiary of the Central Experimental Farm were 79½ lbs. extracted honey per colony. Experiments with different kinds of hives for the production of comb and extracted honey showed that the greatest amount of honey was produced in the Langstroth hive and the smallest amount in a hive 15 by 20 by 15 in. in size. Experiments were also made in feeding sugar for winter stores. The natural stores were removed from 4 colonies on September 17, 1900, and a constant surplus of sirup was kept accessible to the bees, by means of a Miller feeder. The sirup was supplied at about blood heat. No sign of uneasiness or dysentery was observed in the bees during the whole winter. The average weight of the colonies when put into winter quarters was 52½ lbs., and when removed, 40¾ lbs. Experiments with foundations of different sizes in the sections indicated that full sheets of foundation are best. The bees began to work on them first and filled them out better. Only a few of the sections which had only ½ or ¼ sheets of foundation were well filled, while no work was done on sections where no starters were used. Similar results were obtained in experiments with brood foundations of different sizes.

An experiment was made for the purpose of determining whether bees injured whole fruit. On September 7, when there was no surplus honey to be obtained from outside plants, ripe peaches, pears, plums, and grapes were exposed inside the hives, on branches of trees in the apiary inclosure, and on shelves in a workshop to which the bees had access. The fruit was exposed in three conditions with the skin intact, with the skin intact and dipped in honey, and with the skin punctured in several places with the blade of a knife. It was found that wherever the fruit was exposed the bees began work at once upon the fruit that was dipped in honey and upon the punctured fruit; they worked steadily upon the dipped fruit until all the honey was removed, and sucked the juices from the punctured fruit until it began to decay. In no case was any injury done to the whole fruit, whether dipped in honey or not, and this remained true even after the experiment had been continued for 3 weeks, at the end of which time many of the bees began to die of starvation.

Brief notes are also given on the bee moth, packing of bees for shipping in hot weather, moving bees from one part of the apiary to another, and feeding honey, sugar, and water, so as to secure the completion of unfinished sections.

Bees, S. A. Bedford (*Canada Expt. Farms Rpts. 1901, pp. 428, 429*).—The author reports that 2 out of 6 colonies of bees wintered in the cellar died of diarrhea. The disease was due to the frames becoming damp and moldy. The hives were apparently placed too near the cellar wall. Ordinarily it is stated there is little trouble in wintering bees in the cellar in this province.

Treatment of foul brood with essence of rosemary, E. E. Bochatey (*Rev. Internat. Apicult., 24 (1902), No. 1, p. 12*).—This remedy is highly recommended in the treatment of foul brood, on account of its moderate price, and especially on account of the simplicity of the treatment. It is only necessary to place from 15 to 20 drops of the essence of rosemary in one corner of the hive and allow the substance to volatilize.

FOODS—NUTRITION.

An experimental inquiry regarding the nutritive value of alcohol, W. O. Atwater and F. G. Benedict (*Mem. Nat. Acad. Sci., 8* (*1902*), *VI* (*U. S. Senate, 57. Cong., 1. sess., Doc. 233*), *pp. 231–397*).—Twenty experiments are reported, in some of which alcohol was substituted for an isodynamic quantity of fats and carbodydrates. The experiments were made with the aid of the respiration calorimeter with three subjects, one of whom had used alcohol with great moderation since his youth, while the other two had always been abstainers. The amount of alcohol used per day was about 2½ oz., or as much as would be supplied in a bottle of claret, 6 oz. of whisky, or 5 oz. of brandy. The principal conclusions drawn follow: The quantities of alcohol eliminated by the lungs, skin, and kidneys, averaged 1.3 gm. per day. In other words, over 98 per cent of the injested alcohol was oxidized in the body. The average coefficients of digestibility and the fuel values of protein, fat and carbohydrates of ordinary diet as compared with diet containing alcohol are shown in the following table:

Comparison of digestibility and fuel values of nutrients of food in ordinary diet with those of alcohol.

	Heat of combustion per gram.	Digestibility of material.	Availability of energy.	Fuel values.			
				Referred to digestible material.		Referred to total material.	
				Per gram.	Per pound.	Per gram.	Per pound.
	Calories.	*Per cent.*	*Per cent.*	*Calories.*	*Calories.*	*Calories.*	*Calories.*
Protein	5.65	92	70	4.4	2,000	4.0	1,820
Fats	9.40	95	95	9.4	4,260	8.9	4,040
Carbohydrates	4.10	97	97	4.1	1,860	4.0	1,820
Alcohol	7.07	98	98	7.1	3,210	6.9	3,140

"The isodynamic values of alcohol, carbohydrates, and fats are thus in the ratios of 6.9 : 4 : 8.9, and 1 gm. of alcohol would be isodynamic with 1.73 gm. carbohydrates or 0.78 gm. of fats of ordinary food materials. The proportions of food and of the several kinds of nutrients digested and made available for use in the body were practically the same in the experiments with and those without alcohol in the diet. . . . The potential energy of the alcohol was transformed into kinetic energy in the body as completely as that of the ordinary nutrients. The income and outgo of energy were equal in the experiments without alcohol; the same was true in the experiments with alcohol. In all the experiments the body obeyed the law of conservation of energy.

"With the exception of the energy of the external muscular work in the work experiments, all of the energy of the food, including that of the alcohol, left the body as heat, and must therefore have been transformed into heat within the body. Part of this total energy must have been used for the internal mechanical (muscular) work; the energy thus used was therefore transformed into heat before leaving the body.

"The radiation of heat from the body was very slightly greater with the alcohol diet than with the ordinary diet, but the difference was extremely small—enough to make only about 1 per cent of the whole energy metabolized, and not over 6 per cent of the energy of the alcohol.

"The efficiency of alcohol in the protection of body fat from consumption was very evident. The losses of fat were no larger and the gains no smaller with the alcohol diet than with the corresponding diet without alcohol. In this respect there was no indication of any considerable difference between the alcohol and the nearly isodynamic amounts of fats and carbohydrates which it replaced. This was the case in all the experiments.

"The efficiency of the alcohol in protecting body protein was evident, but it was not fully equal in this respect to the isodynamic amounts of the ordinary nutrients. The results, however, were not the same with the different subjects. . . . On the whole these experiments accord with the belief that with some persons, especially with those who are not accustomed to the use of alcohol, it may fail to protect protein; but this action is temporary, and the more permanent influence is to protect protein.

"That a part of the potential energy of the alcohol was transformed into the kinetic energy of muscular work these experiments do not prove, though they make it highly probable. They imply that, so far as the utilization of the total energy of the diet was concerned, there was a slight advantage in economy in favor of the ordinary as compared with the alcohol diet, especially when the subjects were at hard muscular work, but the difference was inside the limits of experimental error and too small to be of practical consequence. On the average it was less than 1 per cent of the total energy, and hardly reached 5 per cent of the energy of the alcohol. From this it follows that the energy of the alcohol was utilized nearly if not quite as well as that of the fats, sugar, and starch which it replaced.

"We repeat that there is a very essential difference between the transformation of the potential energy of alcohol into the kinetic energy of heat, or of either internal or external muscular work, and the usefulness or harmfulness of alcohol as a part of ordinary diet. Regarding this latter question the experiments bring no more evidence than they do regarding the influence of alcohol upon the nervous system or its general effect upon health and welfare."

Some new nutrient preparations, S. WEISSBEIN (*Deut. Med. Wchnschr., 28 (1902), No. 2; abs. in British Med. Jour., 1902, No. 2145, Epit., p. 23*).—Analytical methods suited to the examination of plasmon and similar preparations are described and results obtained are reported.

Some new foods prepared from plant protein, M. WINTGEN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 7, pp. 289–301*).—The composition and digestibility of roborat, aleuronat, and energin, all of which are foods prepared from the protein of cereals, was studied and a bacteriological examination of the products made.

Milk flour in Sweden, V. E. NELSON (*U. S. Consular Rpts., 69 (1902), No. 260, pp. 118, 119*).—According to the author, flours are prepared in Sweden from whole and from skim milk. These materials, it is said, are readily soluble in water and may be used in a variety of ways as food.

Milk flour in Sweden, R. S. S. BERGH (*U. S. Consular Rpts., 68 (1902), No. 257, p. 238*).—A brief note on powder or flour made from skim milk.

Edible fungi, A. ZEGA (*Chem. Ztg., 26 (1902), p. 10; abs. in Chem. Centbl., 1902, I, No. 6, p. 362*).—The composition of *Agaricus esculentus, A. arvensis, Lactarius piperatus*, and *Coprinus comatus*, is reported.

On the composition of the nuts of Gingko biloba, U. SUZUKI (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), pp. 357, 358*).—The author reports an analysis of the nuts of *Gingko biloba* which are used in the Orient as food.

On the occurrence of cane sugar in the seeds of Gingko biloba and Camellia theifera, U. SUZUKI (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), pp. 349, 350*).—The occurrence of cane sugar in these seeds is noted.

Wheat and maize starches of commerce, D. SAARE (*Ztschr. Spiritusind., 24 (1901), pp. 502, 512, 513; abs. in Jour. Soc. Chem. Ind., 21 (1902), No. 2, p. 129*).—The composition and characteristics of wheat starch and maize starch are discussed.

The baking quality of wheat and ways of estimating it, A. MAURIZIO (*Landw. Jahrb., 31 (1902), No. 1, pp. 179–234, pls. 3, fig. 1*).—Different methods of estimating the baking quality of wheat flour were tested. In connection with this work the author determined the amount of carbon dioxid produced by the fermentation of dough and during baking. Some of the principal conclusions follow: In mixing dough as much water should be used as the flour will take up. The maximum volume of bread which can be obtained from 100 gm. of flour is 560 to 580 cc. Medium grade flour will yield 400 to 480 cc., and flour of poor baking quality 250 to 350 cc. The baking quality of medium flour can not be determined by laboratory experiments or practical experiments alone, though pure flour may be readily recognized. The specific gravity of bread furnishes a very valuable indication of the baking quality of flour and grain. Products of the best quality have a specific gravity of 0.23 to 0.28; medium quality of 0.35, and low grade of 0.46 and over.

Milling and baking experiments with domestic and foreign wheat, M. FISCHER (*Fühling's Landw. Ztg., 51 (1902), Nos. 1, pp. 17–28; 2, pp. 43–58; 3, pp. 87–102*).—From milling and baking tests, the author believes German grain to be superior to that from other countries.

Losses in cooking meat, H. S. GRINDLEY (*British Food Jour., 4 (1902), No. 37, pp. 2, 3*).—A summary of a publication noted elsewhere (E. S. R., 13, p. 772).

The manufacture of preserves, P. DEGENER (*Ztschr. Ver. Deut. Zuckerind., 1902, No. 554, II, pp. 193–203*).—The manufacture of jellies and preserves is described and discussed.

The making of jelly from the fruit of Pyrus baccata, W. SAUNDERS (*Canada Expt. Farms Rpts. 1901, p. 82*).—A method is described of making jelly from the fruit of this crab in such a way that unpleasant astringency is avoided.

Should milk be boiled? W. B. RANSOM (*British Med. Jour., 1902, No. 2147, Epit., pp. 440–443*).—A review of the literature led the author to the conclusion that there is no good evidence to show that milk heated to boiling for from 10 to 15 minutes suffers any diminution in food value. The data cited are discussed with special reference to diseases of infants.

Variations in body temperature with special regard to the effect produced on man by a reversal of the ordinary method of living, F. G. BENEDICT and J. F. SNELL (*Arch. Physiol. [Pflüger], 90 (1902), No. 1–2. pp. 33–72, dgms. 27*).—Using the thermometer of special construction previously described (E. S. R., 13, p. 878), the authors made a series of investigations which are reported in detail to determine the normal body temperature, the temperature at different parts of the body, and to study the effect of muscular work and fasting. They also studied the effect of reversing the ordinary method of living—that is, of working during the night and sleeping during the day, upon body temperature. Among the conclusions drawn were the following: Muscular work increases body temperature rapidly, the temperature remains high as long as the work continues. Work of the same intensity produces the same increase in temperature. When work ceases, the temperature soon begins to decrease, and this effect is noticed for a considerable time. During fasting the average temperature is not markedly different from normal temperature if no work is performed. When the subjects fasted and performed severe muscular work, the average temperature was lowered about 1° C. Under the experimental conditions no change in the temperature curve was observed when work was performed at night and subjects rested during the day.

Vegetarian diet and the production of work, BAELZ (*Berlin. Klin. Wchnschr., 1901, No. 26, p. 689; abs. in Hyg. Rundschau, 12 (1902), No. 4, pp. 200, 201*).—The author reports a study of the diet of two Japanese jinrikisha runners. According to this investigation the diet consisted almost entirely of rice, potatoes, barley, chestnuts, and lily bulbs, and furnished less protein than the commonly accepted dietary standard calls for. Japanese diet in general is discussed.

Diet in the several periods of life, E. Palier (*Dietet. and Hyg. Gaz., 18 (1902), No. 5, pp. 257–263*).—A general discussion of the subject.

The dietary of the Scottish peasant, W. G. Little (*Caledonian Med. Jour., 5 (1902), Nos. 1, pp. 22–26; 2, pp. 95–101*).—A general discussion of the subject.

The utilization of sugars (hexoses) by the body, Charrin and Brocard (*Compt. Rend. Acad. Sci. Paris, 134 (1902), Nos. 1, pp. 48–50; 3, pp. 188–190*).—The authors believe that experiments which were made with pregnant women show that levulose, galactose, and glucose rank in the order mentioned, when judged by their utilization in the body economy. Tests also showed that the human body induces cleavage in maltose more easy than in lactose and cane sugar, although the intensity of cleavage and the utilization of the food is believed to depend upon the diet the body is accustomed to. Other conclusions of a special nature were also drawn.

The digestion of carbohydrates in the stomach by ptyalin, Hensay (*München. Med. Wchnschr., 1901, No. 30, p. 1208; abs. in Hyg. Rundschau, 12 (1902), No. 4, pp. 199, 200*).—Examination of the stomach contents showed that larger quantities of starch were digested by ptyalin than might be expected. The possibility of the continuation of ptyalin digestion in the stomach is discussed.

Concerning the influence of fats and carbohydrates upon the protein metabolism in man, T. W. Tallqvist (*Arch. Hyg., 41 (1902), No. 3, pp. 177–189*).—From experiments with man in which the income and outgo of nitrogen was determined the conclusion was drawn that the variations in fat and carbohydrates in the diet influence the amount of nitrogen required, and that carbohydrates protect protein more than fat.

Concerning a special rôle of carbohydrates in the assimilation of insoluble salts by the body, L. Vaudin (*Ann. Inst. Pasteur, 16 (1902), No. 1, pp. 85–93; abs. in Chem. Centbl., 1902, I, No. 9, p. 535*).—According to the author's experiments the carbohydrates formed by the hydrolysis of starch by saliva aid in the solution of earthy phosphates.

The effect of boric acid on the metabolism of man, M. Rubner (*Hyg. Rundschau, 12 (1902), No. 4, pp. 161–170*).—Metabolism experiments in which the respiratory products were taken into account lead the author to the conclusion that boric acid increased the production of carbon dioxid and water vapor and increased the cleavage of fat or carbohydrates in the body.

On the effects of forced feeding in cases of pulmonary tuberculosis and in normal individuals, N. D. Bardswell, F. W. Goodbody, and J. E. Chapman (*British Med. Jour., 1902, No. 2147, pp. 449–451*).—From experiments with healthy individuals of normal weight and in nitrogen equilibrium, the following conclusions were drawn: Forced feeding, i. e., consuming an excessively large diet, caused a marked increase in the amount of nitrogen excreted in the urine, with a proportionate increase in the amount of urea. No diminution in the absorption of nitrogen was observed, but the absorption of fat was diminished. There was a large and rapid gain in weight, which was in every case associated with marked impairment of general health. There was a corresponding loss of weight when ordinary diet was resumed.

The amount of combined pentoses in the body, G. Grund (*Ztschr. Physiol. Chem., 35 (1902), No. 2, pp. 111–133*).—The author studied the methods of estimating pentoses and determined the amount in different organs and tissues of a steer and calf. The largest amount, on an average 0.447 per cent, was found in the steer pancreas (fresh material). The average amount in the other materials examined ranged from 0.021 in the steer muscular tissue to 0.099 in the calf thymus. The results obtained are discussed at some length.

Further investigations on the silica content of animal and human tissues, H. Schulz (*Arch. Physiol.* [*Pflüger*], *89* (*1902*), *No. 1–2, pp. 112–118*).—Continuing previous work (E. S. R., 13, p. 168), analytical data are reported and discussed.

ANIMAL PRODUCTION.

Spontaneous combustion of alfalfa, H. M. Cottrell (*Kansas Sta. Bul. 109, pp. 217–222*).—A number of instances of spontaneous combustion of alfalfa hay are recorded and discussed. In every case this phenomenon was observed with hay of the first cutting, which is ordinarily of rank growth. The spontaneous combustion is apparently due to the imperfect curing of such hay before stacking. According to the author, "some alfalfa growers, in stacking the first cutting of alfalfa, put alfalfa and dry straw or prairie hay in alternate layers. This is a satisfactory way if the dry material is available. Others use 10 to 15 pounds of salt or air-slaked lime for each ton of hay, sprinkling the salt or lime so as to cover as much of each load as possible. Experiments made at this station indicate that considerably less gains are made by cattle when salt is mixed with the feed. A trial of lime on alfalfa, made at this station, showed little effect. From all the experience we have gained to date [it seems probable] that the best way to prevent spontaneous combustion of alfalfa is to thoroughly cure before stacking. It is not often that all the conditions necessary to produce spontaneous combustion are present, and ordinarily there is no danger, where reasonable care is taken, except with the first cutting, and with this cutting only when the growth is rank."

On the changes in the composition of roots during storage, F. T. Shutt (*Canada Expt. Farms Rpts. 1901, pp. 163–166*).—The dry matter, total nitrogen, and the albuminoid and nonalbuminoid nitrogen were determined in mangel-wurzels, carrots, turnips, and sugar beets in the fall, winter, and the spring. According to the author—

"The percentage of albuminoid nitrogen . . . appears to remain fairly constant in the dry matter throughout the period of storage, though in the case of two of the roots, Giant Yellow Globe mangel, and Improved Short White carrot, there had been a notable decrease, due probably, in part at least, to the breaking down of the albuminoids. Since . . . the percentage of total nitrogen (calculated on the dry matter) in the majority of the examples increased somewhat during storage, it necessarily follows that the percentage of nonalbuminoid nitrogen has slightly increased."

The author infers "(1) that nitrates, resulting more particularly from high manuring with soluble nitrogenous fertilizers, and which are more or less injurious to the animal, tend to disappear on storage of the roots; (2) that there is a tendency to fermentative changes during storage that lead chiefly to the destruction of the sugar, the most important nutrient of roots. This deterioration may no doubt in a large measure be controlled by low temperature and good ventilation; under such conditions we imagine the loss does not assume in our winter climate any grave proportions. It would no doubt be found to increase markedly after March. Further, (3) that the nonalbuminoid nitrogenous compounds increase, as a rule, with storage, and especially so during the spring months."

Fodders and feeding stuffs, F. T. Shutt (*Canada Expt. Farms Rpts. 1901, pp. 160–162*).—Determinations are reported of the dry matter and sugar in beets, carrots, and mangel wurzels, special attention being paid in the case of the latter to the sugar content in the portion of the root above and below ground. The larger amount was found in the latter portion. "A consideration of the fact that sugar is the chief constituent of value in roots might lead us to infer, in the light of this experiment, that a system of culture which tends to keep the roots fairly well earthed up is one that will result in the most nutritious crop. Further, those varieties which naturally tend to grow beneath the soil, providing they furnish an adequate yield per acre, will be the most profitable to grow."

Compilation of analyses of fodder articles made at Amherst, Mass., 1868–1901, E. B. Holland and P. H. Smith, jr. (*Massachusetts Sta. Rpt. 1901, pp. 171–192*).—The results of proximate and fertilizer analyses of feeding stuffs are quoted, and in many cases the digestibility is also included.

Corn by-products—gluten meal, gluten feed, etc., F. T. Shutt (*Canada Expt. Farms Rpts. 1901, pp. 185–190*).—Analyses of feeding stuffs including gluten meal, cattle feed, rice feed, calf meal, and potato starch are reported.

Cattle-feed inspection, J. B. Lindsey (*Massachusetts Sta. Rpt. 1901, pp. 152–156*).—Results of the inspection of cattle feeds during the year are briefly stated and the text of the feed stuff law is given.

Coefficients of digestibility of American feed stuffs, J. B. Lindsey and N. J. Hunting (*Massachusetts Sta. Rpt. 1901, pp. 195–216*).—A compilation including the results of experiments with ruminants, swine, horses, and poultry.

Distillery refuse, Dietrich (*Landw. Vers. Stat., 56 (1902), No. 4, pp. 321–366*).—A summary of the information available regarding the manufacture and composition and feeding value of fresh and dry distillery refuse of different sorts.

[Panicum grass] better than sorghum, D. C. Shorey (*Honolulu Bul., 1902, Feb. 7*).—The composition of local grown panicum grass was determined and its food value discussed.

The exact calculation of balanced rations, J. T. Willard (*Industrialist, 28 (1902), No. 21, pp. 319–330*).—A method of calculating rations on the principles of alligation is described.

Cleavage of fat by micro-organisms, K. Schreiber (*Arch. Hyg., 41 (1902), No. 4, pp. 328–347*).—From experiments which are reported in detail, the following conclusions were drawn: Pure fat is not a nutrient medium for micro-organisms. A number of bacteria which occur in soil and elsewhere in nature induce cleavage in fat, provided nutrient material and oxygen are present. Their action is especially energetic if the acid formed is neutralized with calcium carbonate. The cleavage is most rapid when the fat is finely divided as in an emulsion. External conditions, such as temperature, lack of oxygen and light, which hinder the growth of the bacteria under consideration, doubtless hinder in like measure their action upon fat. At any rate, the extent of cleavage brought about by different species is affected in many ways. A number of molds also induce cleavage in fat. Their action is not diminished by the acidity of the fat on which they grow. The adipolytic power of the micro-organisms mentioned is intimately connected with their life processes and is dependent upon the presence of oxygen. In the case of anaerobic bacteria, there is probably a slight cleavage of fat which is, however, not sufficient to be regarded as destructive.

Calcium soaps as a proof that the resorption of fat takes place in aqueous solutions, E. Pflüger (*Arch. Physiol.* [*Pflüger*], *89 (1902), No. 5–6, pp. 211–226*).—Continuing earlier work (E. S. R., 13, p. 775), the author discusses critically the experiments of a number of investigators, the final conclusion being that all digestion is a process of hydrolysis, and that all resorption is a diffusion of substances in aqueous solutions.

Concerning pepsin, C. A. Pekelharing (*Ztschr. Physiol. Chem., 35 (1902), No. 1, pp. 8–30*).—A chemical study of pepsin from pigs' and from dogs' stomachs. The author obtained the latter in a very pure form of practically constant chemical composition.

The movements of the intestines studied by means of the Röntgen rays, W. B. Cannon (*Amer. Jour. Physiol., 6 (1902), No. 5, pp. 251–277, figs. 10*).—When bismuth subnitrate is mixed with food, the movements of the intestinal contents can be observed with a fluorescent screen. Experiments with a cat are reported. The author found that "signs of emotion, such as fear, distress, or rage, are accompanied by a total cessation of the movements of both large and small intestines. The movements continue in the cat both during sleep and at night." Other conclusions regarding the movements of the food in the intestines, etc., are given.

Digestion in the small intestine, F. KUTSCHER and J. SEEMANN (*Ztschr. Physiol. Chem., 34 (1902), No. 5–6, pp. 528–543*).—From experiments reported in detail, the conclusion was drawn that under normal conditions trypsin induces in the small intestine a cleavage of protein to such an extent that crystallizable products are formed. Of these the authors have identified only leucin, tyrosin, lysin, and arginin. Such cleavage products may be so changed in the intestinal wall that they are unrecognizable. Noticeable amounts of albumoses and peptones were not found in the intestinal contents.

The metabolism of phosphorus, calcium, and magnesium by herbivora, F. TANGL (*Arch. Physiol. [Pflüger], 89 (1902), No. 5–6, pp. 227–239*).—A number of experiments with horses on the metabolism of phosphorus, calcium, and magnesium are reported. According to the author, these show that a certain parallelism exists between the metabolism of nitrogen and phosphorus. The amount of phosphorus, calcium, and magnesium required per kilogram body weight is discussed, as well as related topics.

Concerning the metabolism of horses, T. PFEIFFER (*Landw. Vers. Stat., 56 (1902), No. 4, pp. 283–288*).—A controversial article.

Remarks on Pfeiffer's criticisms, N. ZUNTZ and O. HAGEMANN (*Landw. Vers. Stat., 56 (1902), No. 4, pp. 289–292*).—A reply to the above.

Steer feeding experiments, J. H. GRISDALE (*Canada Expt. Farms Rpts. 1901, pp. 277–290*).—Continuing earlier work (E. S. R., 13, p. 270), several feeding tests with steers are reported. The comparative gains made by calves, yearlings, 2-year-olds and 3-year-olds was studied with 4 lots, lot 1 containing 5 animals, and the other lots 9 each. The calves in lot 1 were fed for 196 days, the other animals for 203 days. The calves gained on an average 2.09 lbs. per day, the cost per pound of gain being 3.24 cts. The yearlings, 2-year-olds, and 3-year-olds gained respectively 1.55, 1.58, and 1.76 lbs., the corresponding cost of a pound of gain being 5.77, 5.71, and 6.37 cts.

The comparative gains made by dehorned steers and those not dehorned were tested with 2 lots of 9 each. The former were loose—the latter tied in stalls. The average daily gain under similar conditions of feeding was 1.78 and 1.7 lbs., respectively; the cost of a pound of gain 6.55 and 6.60 cts. The gain made by large and small lots of dehorned cattle, all loose, was tested with 3 lots containing respectively 9, 6, and 3 steers. The average daily gains were 1.78, 1.79, and 1.7 lbs., the cost of a pound of gain being 6.55, 6.25, and 6.76 cts.

The test previously reported (E. S. R., 13, p. 270) on the comparative merits of a limited and a full fattening ration was continued under practically the same conditions, and a second test with 2 lots of 5 calves each undertaken. The average daily gain in the new test (covering 28 weeks) on a full fattening ration was 1.92 lbs., and the cost of a pound of gain 2.6 cts. On a limited growing ration the corresponding values were 1.68 lbs., and 2.49 cts. The average daily gain in the test covering a year on the limited ration was 1.14 lbs., the cost of a pound of gain 3.42 cts., the daily gain on a full ration 1.9 lbs., the cost of a pound of gain 8.53 cts.

Steer feeding; dehorning, R. ROBERTSON, S. A. BEDFORD, and A. MACKAY (*Canada Expt. Farms Rpts. 1901, pp. 360–365, 422–427, 507–510, pl. 1*).—At the Experimental Farm of the Maritime Provinces the comparative merits of feeding loose and tied in stalls was tested with dehorned and not dehorned steers. One lot of steers fed loose in a box stall was led to water, the others were not. Three of the lots contained 8 animals and one of the lots 4. The dehorned steers fed loose gained 231 lbs. and those tied 286 lbs. each, on an average. The steers not dehorned fed tied made an average gain of 278 lbs. each, and the dehorned steers fed loose and turned out to water 282 lbs. Considering the test as a whole, which covered 135 days, the average daily gain per steer was 2.19 lbs.; the cost of a pound of gain, 7.42 cts.

Limited and full rations were tested with 2 lots of 6 calves each. The ration at first consisted of whole milk and skim milk. Grain and other feeds were added gradually, and finally the milk was omitted. In 196 days of the test the average daily gain on a full fattening ration was 1.64 lbs.; the cost of a pound of gain, 4.64 cts. The corresponding values on a limited growing ration were 1.22 lbs. and 4.4 cts.

At the Manitoba Experimental Farm the total gain in 20 weeks of 4 steers not dehorned and tied in stalls was 852 lbs.; of 4 dehorned steers tied in stalls 640 lbs.; and of 4 dehorned steers loose 852 lbs., the rations in every case being similar. The greatest profit, $42.49, was obtained with the horned steers; the least, $32.81, with the dehorned steers tied in stalls. The station also tested the comparative merits of speltz and mixed grain (oats, wheat screenings, and barley, 1:1:1) with 2 lots of 2 steers each. All the grains were chopped, the speltz with the chaff. In addition to grain, both lots were fed straw, corn fodder, and silage. The total gain in 16 weeks on speltz was 308 lbs., on mixed grains 228 lbs.; the profit on the 2 lots, $24.54 and $20.82. Two steers pastured on brome grass 16 weeks each gained 245 lbs. Brief notes are given regarding the station bulls.

At the Indian Head Experimental Farm 5 horned steers tied gained 790 lbs. in 16 weeks; 5 dehorned steers tied gained 600 lbs. The same number of steers dehorned and fed in box stalls gained 1,090 lbs., the feed in every case being similar. The total profit per head in the 3 lots was $9.99, $9.11, and $12.74.

The cost of beef, H. M. Cottrell (*Industrialist, 28 (1902), No. 30, pp. 450–453*).—On the basis of a feeding experiment made at the Kansas Agricultural College, the author discusses the cost of fattening steers of different breeds.

Preliminary report on Argentina as a market for pure-bred cattle from the United States, D. E. Salmon (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 37, pp. 4*).—Statements are made concerning the sort of cattle in demand in Argentina, the quarantine regulations of that country, and related topics.

Mexico as a market for pure-bred beef cattle from the United States, D. E. Salmon (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 41, pp. 28, map 1*).—The advantages of Mexico as a market for pure-bred cattle from the United States are treated of. Suggestions are given for introducing such cattle into Mexico, the Mexican Government regulations are pointed out, and the kind of cattle which are most satisfactory for export are described. The author also discusses the selling price of such cattle and quotes a number of letters from the United States consuls in Mexico on the general subject.

Some experiments with beet pulp as a stock food, C. D. Smith (*Michigan Sta. Bul. 193, pp. 1–16, 20–27*).—Two tests on the feeding value of beet pulp are reported. In the first, which was made by L. M. Geismar, a lot of 30 steers was fed a ration of grain, hay, stover, and beet pulp, while a second lot of 20 steers was fed the same ration of grain and coarse fodder, but no pulp. All the steers were fed for maintenance rather than for fattening. In the 3 months of the test the lot fed beet pulp made an average daily gain of 1.42 lbs., consuming per head per day 55 lbs. of beet pulp, 8.5 lbs. of mixed hay, 4 lbs. of shredded corn stover, and 2.4 lbs. of ground corn and beet seed. The lot receiving no pulp made an average daily gain per head of 0.684 lb., consuming 11.5 lbs. of mixed hay, 8 lbs. of shredded corn stover, and 2.4 lbs. of the same grain mixture as lot 1. The author calculates that in this test a ton of beet pulp took the place of 421.5 lbs. of corn stover, 274 lbs. of mixed hay, and 68.8 lbs. of grain.

The second test, which was carried on by W. C. Bourns, was made with 2 lots of 10 steers each. Both lots were fed what was considered a fattening ration, consisting of mint hay, wheat bran or oats, and corn meal, lot 2 receiving beet pulp in addition. The steers in lot 1 made an average daily gain of 1.84 lbs., and those in lot 2 an average daily gain of 2.52 lbs. It was calculated that in this test a ton of pulp was equivalent to 244 lbs. of mint hay, 32.6 lbs. of wheat bran, 296 lbs. of corn meal, and 27.2 lbs. of oats. These tests were favorable to the use of beet pulp, but the author calls attention to the fact that more experiments are needed before definite conclusions can be drawn.

A number of letters from farmers are quoted, as well as results of tests at other experiment stations.

"The consensus of opinion among farmers who have fed pulp is that for milch cows it is a good feed, although the pulp from frozen beets should be used with caution. Growing and fattening cattle do well on it, and owners declare that it saves one-third of the coarse fodder. Both fattening lambs and breeding ewes like pulp, and for them it proved a valuable factor in the ration."

Sheep, J. H. GRISDALE (*Canada Expt. Farms Rpts. 1901, pp. 290, 291*).—Brief notes on the station flock and on the feeding value of rape.

Sheep, R. ROBERTSON (*Canada Expt. Farms Rpts. 1901, p. 367*).—A brief statement concerning the flock at the Maritime Provinces Experimental Farm.

Swine, J. H. GRISDALE (*Canada Expt. Farms Rpts. 1901, pp. 291–295*).—Besides statistics and a discussion of the causes of soft pork, a feeding test with 4 lots of 4 pigs each was briefly reported. In addition to meal (equal parts of corn and of oats, barley, and peas) and skim milk, lot 1 was fed turnips, lot 2 mangel-wurzels, lot 3 sugar beets grown for forage, and lot 4 sugar beets grown for sugar. At the beginning of the trial the pigs ranged in weight from 57 lbs. in lot 4 to 101 lbs. in lot 1. Lots 1, 2, and 3 were fed 106 days, and lot 4 was fed 138 days. The average daily gain per pig in the 4 lots was 0.85, 0.90, 1.18, and 0.95 lbs., respectively, the corresponding cost per pound of gain being 3.69, 4.0, 3.22, and 3.6 cts.

Pigs, R. ROBERTSON, S. A. BEDFORD, and A. MACKAY (*Canada Expt. Farms Rpts. 1901, pp. 366, 367, 427, 510*).—The gain made by different breeds of pigs on corn meal and crushed oats, pea meal and crushed oats, shorts, and buckwheat, fed in every case with skim milk, was studied at the Maritime Provinces Experimental Farm. Deductions were not drawn from the test, which is very briefly reported. Notes are given regarding the pigs at the Manitoba and Indian Head farms.

Further experiments on different methods of preserving pork (*Ber. K. Vet. Landbohöjskoles Lab. Landökon. Forsög [Copenhagen], 1902, pp. 57, pls. 2*).—Experimental data are reported and discussed.

Report of the poultry manager, A. G. GILBERT (*Canada Expt. Farms Rpts. 1901, pp. 313–334, pl. 1, fig. 1*).—The author records the usual data regarding the poultry kept at the Ottawa Station, the egg production, growth made by chickens, the observations and investigations on hatching eggs, the feeding and care of chickens, and similar topics. Based on experience at the station, the statement is made that a mash, when fed in too great quantities to 1 and 2 year old hens, is apt to create an overfat condition, which, in the case of the heavy breeds, is likely to be fatal. If fed in too great quantity as a morning ration, mash is likely to make the hens disinclined for exercise. It is decidedly a valuable aid to molting hens, and is a convenient form of utilizing much of the farm and farmhouse waste. Where hens have had a comparatively free run, its beneficial effect in egg production has been noticeable. In a more or less liquid form a mash is an invaluable means of quickly fattening old or young stock.

Two feeding tests with chickens fed in crates and those having limited and unlimited runs are briefly reported. The author recommends that the chickens should be placed in crates either before or after they begin to molt, when 4½ or 5 months old, preferably at the earlier period. In both tests the greater gains were made by the chickens fed in crates. In a study of breeds, Buff Orpingtons, Rhode Island Reds, and Salmon Faverolles were compared, the results being briefly reported.

Continuing early work (E. S. R., 13, p. 277) on the different methods of preserving eggs, the following conclusions are drawn:

"The common salt solutions without lime, both 1 per cent and 2 per cent, caused the eggs to have a more marked and disagreeable odor, especially on cooking. All the eggs in the 2 per cent fluid were unusable. Vaseline-covered eggs were not quite as well preserved as those simply in lime water. The paraffin-covered eggs were decidedly inferior to those simply preserved by lime water. The eggs dipped in a solution of permanganate of potash were decidedly bad, showing that the claims for this much-vaunted chemical are without foundation. In summing up the conclusions, we feel justified in repeating the statement that saturated lime water is a most effective preservative. We can further say that it is a cheap, easily prepared, and pleasant fluid to handle. The addition of a small amount of salt (not exceeding 1 per cent) appears to be an advantage, but a larger amount—even 2 per cent—of salt is decidedly detrimental to the quality of the preserved eggs."

Report of cooperative experiments with egg preservatives, W. R. Graham (*Ontario Agr. and Expt. Union Rpt. 1901, pp. 31-33*).—Comparative tests of the merits of different egg preservatives led to the following conclusions:

"Where eggs were put up in ordinary salt, the evaporation was equal to 33 per cent of the contents of the egg. Where the eggs were greased this was reduced to 25 per cent. There is no evaporation of the egg with the water-glass or lime solution. Three per cent of the eggs put up in salt were bad, but where the eggs were greased there were none bad. In the experiments with water-glass, one to five, the eggs scored 44 out of a possible 50. Where the water-glass was one to seven, the eggs scored 43.2 out of 50. With the lime and salt solution the eggs scored 40, and in the lime water they scored 41. The eggs put up in salt scored 37, and the greased egg put up in salt scored 38."

Poultry, R. Robertson, S. A. Bedford, and A. Mackay (*Canada Expt. Farms Rpts. 1901, pp. 367, 368; 427, 428, 510*).—Brief statements are made concerning the poultry kept at the Maritime Provinces, Manitoba, and Indian Head Experimental Farms. At the Manitoba Farm the average cost of a pound of gain in a test covering about a month was 3.66 cts. with Light Brahmas and 4 cts. with Plymouth Rocks. Four Light Brahmas fed oats and skim milk for 20 days gained 8 lbs. and 5 ozs., at a cost of 3.7 cts. per pound. The same number of Light Brahmas fed mixed grains gained 7 lbs. and 7 ozs., at a cost of 3.9 cts. per pound.

The digestibility of maize by chickens, S. Paraschtschuk (*Jour. Landw., 50 (1902), No. 1, pp. 15-32*).—Four experiments on the digestibility of maize by chickens are reported. The urine and feces were collected separately, this being rendered possible by a surgical operation, which is described. It was found on an average that the coefficient of digestibility of maize was as follows: Organic matter, 89.21; protein, 92.5; fat, 83.43; crude fiber, 62.40; nitrogen free extract, 91.76; mineral matter, 43.35. In one of the tests, which covered 3 days, the average amount of nitrogen consumed per day was 1.22 gms.; the amount excreted in the urine 0.830 gms., and in the feces 0.120.

The intestinal bacteria of chickens, M. Rubner (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), No. 6, p. 239; Hyg. Rundschau, 12 (1902), No. 9, p. 448*).—A bacteriological study of the intestines and dejecta of young chickens. The dejecta of newly hatched chickens were sterile. Bacteria appeared after 2 days.

The value of intestinal bacteria in nutrition, II, M. Schottelius (*Arch. Hyg., 42 (1902), No. 1-2, pp. 48-70*).—Continuing earlier work (E. S. R., 10, p. 885), the author reports experiments which lead to the conclusion that intestinal bacteria are necessary. Chickens hatched under sterile conditions and fed sterile food lived from 10 to 30 days only, yet they ate regularly and produced an abundance of feces. Similar chickens grew rapidly after they were fed cultures of *Bacillus coli gallinarium*, the bacillus which is apparently the first one to make its appearance in the intestinal tract of normal chickens.

Robinson method of breeding squabs, E. C. RICE (*Boston: Plymouth Rock Squab Co., 1902, pp. 79, pl. 1, figs. 41, dgms. 7*).—Detailed directions are given for raising squabs for market. The volume embodies the results of a number of years of practical experience.

DAIRY FARMING—DAIRYING.

Feeding experiments with dairy cows, C. D. SMITH (*Michigan Sta. Bul. 193, pp. 16–19*).—The feeding value of sugar-beet pulp was tested with 2 lots of 4 cows each. The experiment covered 2 periods of 6 weeks each, the first week in each period being considered as preliminary. Pulp was fed to lot 1 during the first period and to lot 2 during the second period, a hay and grain ration being fed to both lots throughout the experiment. Both lots increased in weight when eating pulp, and lost in weight on dry feed alone. When pulp was fed the 2 lots ate 9,463 lbs. of pulp, 3,381 lbs. of hay, 2,259 lbs. of bran, and 1,124 lbs. of corn meal, and when no pulp was fed 3,649 lbs. of hay, 2,431 lbs. of bran, and 1,217 lbs. of corn meal. The amount of pulp eaten was therefore offset by 268 lbs. of hay, 172 lbs. of bran, and 93 lbs. of corn meal. When fed pulp the 2 lots gave 7,258.6 lbs. of milk and 259.67 lbs. of butter fat, as compared with 6,843.6 lbs. of milk and 258.27 lbs. of fat when no pulp was fed, showing practically no increase in the yield of fat due to feeding pulp, but a total increase of 415 lbs. in the yield of milk.

Feeding trials with dairy cows, D. A. GILCHRIST and A. C. HALL (*Reading Col., Agr. Dept. Rpt. 1901, pp. 42–46*).—Three rations made up of different combinations and quantities of mangels, brewers' grains, oats, wheat, beans, and cotton-seed cake in addition to 6 lbs. of straw and 20 lbs. of hay were compared with 3 lots of 4 cows each. The test proper lasted 6 weeks. The ration composed of 28 lbs. of mangels, 2 lbs. of oats, 1 lb. of wheat, and 5 lbs. of cotton-seed cake gave the best results.

Experiments with dairy cattle, J. H. GRISDALE (*Canada Expt. Farms Rpts. 1901, pp. 269–277*).—Tabulated data are given for 3 experiments conducted to ascertain the influence of milking cows at equal and unequal intervals. The results confirm the conclusions stated in the previous report that where the intervals between milkings are unequal the richer milk is produced after the shorter interval and that where the intervals are equal there is no appreciable difference in the quantity or the quality of the milk.

An experiment with 2 lots of 3 cows each is reported in which a ration consisting of barley, oats, and oil meal fed dry was compared with a ration consisting of bran and gluten feed fed wet. The rations were fed for 2 periods of 14 days each, and were reversed at the end of the first period. On the ration fed wet the 6 cows gave a total daily yield of 114 lbs. of milk, containing 3.83 per cent of fat, and on the ration fed dry a daily yield of 116½ lbs. of milk testing 3.99 per cent of fat, showing an increased daily yield of butter fat of 6 per cent in favor of dry feed.

Dairying in the South, S. M. TRACY (*U. S. Dept. Agr., Farmers' Bul. 151, pp. 48, figs. 4*).—The natural advantages of the South for dairying are pointed out and suggestions are given concerning the construction of dairy buildings, the formation and management of a dairy herd, watering and feeding cows, handling milk, butter making, etc.

Dairy herd records, J. H. GRISDALE, R. ROBERTSON, and S. A. BEDFORD (*Canada Expt. Farms Rpts. 1901, pp. 266–269, 357–359, 422*).—Records for one year are given of 19 cows at the Central Experimental Farm, of 22 cows at the Experimental Farm for the Maritime Provinces, and of 21 cows at the Experimental Farm for Manitoba.

The milk of spayed cows, H. LERMAT (*L'Ing. Agr. Gembloux, 12 (1902), No. 11, pp. 516–523*).—Analyses of the milk of spayed cows showed no more uniformity in composition than ordinary milk. In general there was a notable increase in the content of fat and sugar and to some extent in the content of casein. The author considers that such milk is especially suited for infants.

Composition of the milk of sheep, TRILLAT and FORESTIER (*Jour. Agr. Prat., n. ser., 4 (1902), No. 28, pp. 38, 39*).—The authors analyzed 171 samples of milk obtained during February, March, and April in 6 localities. Some of the results are summarized. Ten samples obtained in the region of Roquefort showed the following average composition: Solids 18.9, fat 6.98, sugar 5.53, casein 5.54, ash 0.96, lime 0.25, and acid 2.66 per cent.

Comparative skimming qualities of Holstein, Ayrshire, and Jersey milk, J. MAHON (*Queensland Agr. Jour., 10 (1902), No. 6, pp. 446, 447*).—In 2 tests the 3 kinds of milk were separated under similar conditions. The percentage of fat in the skim milk was lowest in the case of Jersey milk and highest in the case of Holstein milk, though the difference was not marked.

Influence of food on the quality of milk, W. E. G. ATKINSON (*Jour. Southeast. Agr. Col. Wye, 1902, No. 2, pp. 115–120*).—Data are given for an experiment in which 6 cows were fed a ration composed of cabbages, oat straw, bean meal, and barley meal during a preliminary period, after which 2 of the cows received in addition corn meal and 2 linseed meal. Variations observed in the percentages of fat were not consistent with changes in the rations fed and are considered as due to other causes, such as the weather.

Effect of feed on the composition of milk and on the consistency or body of butter, J. B. LINDSEY ET AL. (*Massachusetts Sta. Rpt. 1901, pp. 162–168*).—A summarized account is given of an experiment similar to work previously reported (E. S. R., 13, p. 385). Two lots of 5 cows each were fed for periods of 3, 5, 6, and 4 weeks, respectively. Lot 1 received during the 4 periods a daily ration consisting of 3 lbs. of wheat bran, 5 lbs. of ground oats, ½ lb. of cotton-seed meal, and ½ lb. of gluten meal, in addition to hay and rowen. Lot 2 received the above ration during the first period, and the same ration a portion of which was replaced, respectively, by cotton-seed meal containing a minimum amount of oil, cotton-seed meal with the addition of cotton-seed oil, and Cleveland flax meal during the second, third, and fourth periods. The author gives the more important results as follows:

"(1) Cotton-seed meal with a minimum percentage of oil did not alter the percentage composition of the milk.

"(2) The addition of one-half to three-fourths of a pound of cotton-seed oil to the cotton-seed meal appeared to increase the fat percentage in the milk about four-tenths of one per cent, and this increase was maintained during the 6 weeks of the feeding period.

"(3) The substitution of Cleveland flax meal for the cotton-seed meal and oil resulted in a decrease of the fat in the milk to about the percentage found in the first period, while the nitrogen percentage was increased. This change in composition was probably due to the removal of the cotton-seed oil from the ration, and not to the influence of the flax meal.

"(4) Cotton-seed meal with minimum oil caused no marked variation in the chemical composition of the butter fat.

"(5) The addition of cotton-seed oil to the cotton-seed meal ration produced a noticeable increase in the melting point and iodin number of butter fat.

"(6) Cotton-seed meal with a minimum oil produced a firm butter.

"(7) The addition of cotton-seed oil, while it increased the melting point of the butter fat, produced a softer, more yielding butter than that produced by either the cotton-seed meal or the standard ration.

"(8) An excess of cotton-seed oil in the ration is likely to affect the health of the animal."

The production of milk and butter—variations in the composition of butter, L. MALPEAUX and J. DELATTRE (*Ann. Agron., 28 (1902), No. 4, pp. 209–223*).—Causes of variation in the composition of butter are discussed and experiments relating especially to the influence of food are reported. Determinations were made of the volatile and fixed fatty acids, saponification number, and the critical temperature of solubility in alcohol, of butter made from the milk of cows fed sugar-beet pulp, beets, brewery residue, malt sprouts, bran, and different oil cakes and forage crops. Pulp, brewery residue, and black medic in comparison with beets lowered the content of volatile fatty acids. During two seasons the percentage of volatile fatty acids was lower when cows were pastured than when fed green forage in the stable, the difference being considered largely due to food. Horse beans increased the volatile fatty acids, and colza, copra, linseed and cotton-seed cakes reduced the percentage in the order named. The establishment of a fixed limit for the proportion of volatile fatty acids in butter is discussed. Of 71 determinations made by the authors only 1 showed a percentage less than 5, while the average was 6.14. It is pointed out, on the other hand, that the percentage of volatile fatty acids in Dutch butter often falls below 5.

Effects of variations in the ripening and churning of cream upon the butter produced, D. A. Gilchrist (*Reading Col., Agr. Dept. Rpt. 1901, pp. 47–50*).—Butter churned into small grains and into lumps contained, respectively, 11.4 and 12.5 per cent of water. The loss of fat in buttermilk from sweet cream was much greater than in buttermilk from ripened cream. Immersing butter in water at 70° F. for 15 minutes and churning slightly increased the weight 3 per cent. Salting butter in brine did not increase the water content over dry salting.

Killing tubercle bacillus in milk by exposure to temperatures under 100° C., E. Levy and H. Bruns (*Hyg. Rundschau, 11* (*1901*), *No. 14, pp. 669–675*).—Experiments were carried out during which milk containing tubercle bacilli was subjected for different lengths of time to various temperatures under 100° C. The tubercle bacilli were obtained from pathological tissue of bovine origin. From these experiments it is concluded that when milk is exposed in a water bath to a temperature of from 65 to 70° C. for a period of from 15 to 25 minutes, all bacteria contained in the milk are destroyed. This method of sterilization is not recommended for practical use in individual families, but it is believed to be practical for dairymen. It is urged that care should be taken to have the milk and vessels in which it is contained heated to a proper temperature before beginning the treatment in order to be sure that a sufficient temperature is maintained during the whole period.

A micrococcus the thermal death limit of which is 76° C., H. L. Russell and E. G. Hastings (*Centbl. Bakt. u. Par., 2. Abt., 8* (*1902*), *No. 11, pp. 339–342, pl. 1*).—A description is given of the micrococcus used in pasteurization experiments at the Wisconsin Station (E. S. R., 13, p. 986).

Compilation of analyses of dairy products made at Amherst, Mass., 1868–1901, E. B. Holland and P. H. Smith, Jr. (*Massachusetts Sta. Rpt. 1901, p. 193*).—Average analyses of 3,281 samples of milk, 3 of human milk, 2 of colostrum, 358 of skim milk, 31 of buttermilk, 203 of cream, 131 of butter, and 8 of cheese.

Canadian butter as exported, F. T. Shutt (*Canada Expt. Farms Rpts. 1901, pp. 190, 191*).—An analysis of one sample of butter reported as adulterated with oleomargarine by the customs analyst at Havana showed a fat content of 83.15 per cent, Reichert number of 27.45, saponification equivalent of 249.3, and a specific gravity of 0.912.

Butter and margarin, L. Grandeau (*Jour. Agr. Prat., n. ser., 3* (*1902*), *No. 25, pp. 789–791*).—Statistics on the production and consumption of margarin in different countries.

Annual report of the experiment station for cheese making at Lodi, 1901 (*Ann. R. Staz. Sper. Caseif. Lodi, 1901, pp. 148*).—In addition to a report of the director on the work of the station during the year and a statement concerning the amount of the different kinds of cheese produced, this includes articles on the following subjects: An experiment in feeding calves with skim milk; use of separator skim milk; conferences on butter and separators at the Lodi exposition; researches and observations on the industrial use of casein; use of casein in the clarification of wine; experiments on the feeding value of oil cakes for dairy animals; new lacto-densimeter for the determination of solids in milk; development of the cheese industry in Sardinia.

Annual reports of the dairymen's associations of the Province of Ontario, 1901 (*Ontario Dairymen's Assocs. Rpts. 1901, pp. 176*).—Among the subjects discussed and reported in the proceedings are the following: Developing a Dairy Herd, by J. E. Gould; Dairy Chemistry, by R. Harcourt; Creamery Leaks, by J. W. Hart; Creamery and Cheese Factory Buildings, by J. A. Ruddick; The Canadian Dairy Industry, by S. Fisher; Practical Cheese Making, by G. G. Publow; Bacterial Infection of Cheese, by W. T. Connell; Permanent Pasture and Hay Mixtures, by J. Fletcher; Conditions Affecting the Curing of Cheese, by L. L. Van Slyke; Developing a Dairy Herd, by H. H. Dean; Silos and Silage, by H. H. Dean; Cheese Making, by G. G. Publow; Cold Storage for Hot Weather Cheese, by H. H. Dean; Bitter Milk and Cheese, by F. C. Harrison; Summer Creameries, by A. Smith; Continuous Pasteurization of Milk for Butter Making, by F. C. Harrison; Loss of Casein and Fat by Washing Curds, by R. Harcourt; The Marketing of Cheese and Butter, by A. Pattullo; Judging Cheese, by A. F. MacLaren; Transportation, by A. F. MacLaren; and Judging Butter, by I. W. Steinhoff.

Dairy legislation, J. B. Lindsey (*Massachusetts Sta. Rpt. 1901, pp. 156–160*).—An act to provide for the protection of dairymen is given and the work of the station in compliance with this law is reported. Of 5,041 pieces of glassware tested, 291 were found to be incorrect.

Officials, associations, and educational institutions connected with the dairy interests of the United States for the year 1902 (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 36, pp. 8*).

VETERINARY SCIENCE AND PRACTICE.

Annual report of the board of cattle commissioners, A. Peters, L. F. Herrick, and C. A. Dennen (*Massachusetts State Bd. Cattle Com. Rpt. 1901, pp. 97, figs. 3*).—The authors present a historical account of the establishment of the work of the Board of Cattle Commissioners of the Commonwealth of Massachusetts. During the past year the principal item of expense in conducting operations was incurred in combating tuberculosis. The operations of the cattle commissioners against tuberculosis were as usual along 3 lines: The maintenance of quarantine regulations, inspecting animals and herds, and testing herds with tuberculin at the request of owners. Detailed notes are given on the number of animals imported into the State and shipped out of the State at different points, and a tabular statement is given of the number of herds and animals inspected and the number of animals found infected with various diseases. During 1901 little work was done in the direction of testing whole herds. Only 5 herds were tested, comprising 75 animals. Of these 23 were killed. The State still pays an indemnity for animals condemned for tuberculosis, and the expense is therefore considerable.

During the year glanders has continued to prevail in many different parts of the State. A larger number (745) of cases were reported than ever before. The disease is controlled with comparative ease in small towns and outlying country districts, but in large cities, especially in Boston, much difficulty has been experienced in preventing the spread of glanders. It has been found that many horses suffering from a chronic form of the disease are owned by express companies and other organizations which possess large numbers of horses, and healthy animals are thus continually exposed to infection. Of the 745 animals which were killed on account of being affected with glanders 4 were mules and the rest were horses.

During the year little trouble from blackleg was reported to the commission. A peculiar disease previously reported by the commission as closely resembling blackleg proved on further investigation to be identical with blackleg; the disease merely existed under peculiar conditions, with unusual symptoms.

A number of cases of actinomycosis were reported during the year; 4 cases were observed in the udder. No cases of Texas fever were noticed. A few isolated cases of rabies were reported from different localities. During the year 23 reports of outbreaks of hog diseases were received, and of these cases 12 proved to be hog cholera.

Annual report for 1900 of the principal of the Royal Veterinary College, J. McFadyean (*Jour. Roy. Agr. Soc. England, 62 (1901), pp. 215–228*).—During the year 1900, 577 outbreaks of anthrax were reported. As a rule only 2 or 3 cases of the disease occurred in each outbreak. Attention is called to the necessity of destroying the carcasses of animals dead of anthrax in order to prevent its further spread among susceptible animals. During the season a considerable increase in the number of cases of glanders was reported, there being 1,865 affected horses. While mallein is freely used for the detection of incipient cases of this disease, it is stated that in many instances the mallein test is not applied until cases of the disease are observed which may be recognized from the clinical symptoms.

After 5 years' complete freedom from foot-and-mouth disease it reappeared in 1899 and spread to a serious extent, in spite of the efforts of the board of agriculture to stamp it out. A brief historical statement is given of the outbreaks of this disease in England since 1839. During the year 1900, 21 outbreaks were reported, in which 266 animals were attacked. The symptoms and course of the disease in cattle, sheep, and pigs are discussed. There are a number of diseases of sheep which resemble foot-and-mouth disease to some extent and are occasionally mistaken for it. Among these mention should be made of foot rot, malignant aphtha, and a disease which is not well known, and commonly called "orf." This disease attacks lambs up to a year of age, and rarely appears in adult sheep. In the course of the disease lesions appear on the face and on the leg from the hoof as far up as the knee.

During the season 1,940 outbreaks of hog cholera were reported. It was observed in this connection that the extent of each outbreak was less than in previous years.

It appears that rabies was entirely eradicated from Great Britain in 1900, and no cases have subsequently been discovered.

An account is given of the extent of disease from stomach worms in cattle and sheep. Experiments with thymol in the treatment of this disease were unsatisfactory. The maximum quantity of thymol for each animal was 2½ ozs. in 5 equal doses covering a period of 25 days, and it is believed that these were the largest doses which could be safely administered. It is suggested that the presence of stomach worms is a frequent cause of chronic diarrhea, and has sometimes been mistaken for generalized tuberculosis.

The sheep botfly is not of such common occurrence in England as to cause serious trouble. Occasional complaints are made of the attacks of this insect. Recommendations are made concerning methods for preventing trouble from this source.

While fowl cholera has been considered of rare occurrence in England, a few outbreaks of the disease were reported and investigated. The symptoms of the disease are described and preventive measures recommended.

Report of the chief inspector of stock, C. J. Valentine (*Rpt. Min. Agr. South Australia, 1900–1901, pp. 23–26*).—Brief notes are given on the prevalence of ticks, lice, fluke worms, foot rot, and ophthalmia among sheep. A number of cases of poisoning are reported from eating various plants, such as *Lotus australis* and *Euphorbia drummondi*. Among the cattle of the colony 42 cases of pleuro-pneumonia were observed and 510 cases of tuberculosis were reported. Brief notes are also given on actinomycosis and cancer in cattle. Notes are presented on the sanitary condition of horses and camels in the colony.

Report of the chief inspector of stock, P. R. GORDON (*Queensland Dept. Agr. Rpt. 1900–1901, pp. 81–87*).—Brief statistical notes on the extent of various diseases in Queensland during this season, on the numbers and distribution of horses, on brands, and marsupials. It is reported that during the season pleuro-pneumonia prevailed in a number of localities, but not in a very virulent form. Some loss from ticks is reported and a number of dips were tested with reference to their efficiency in destroying the ticks.

Report of the veterinary service of the minister of internal affairs for the year 1898 (*Otchet Vet. Uprav. Min. Vnutr. Dyel, St. Petersburg, 1901, pp. 597*).—A general statistical account of the number of domesticated animals in various parts of Russia, together with notes on the extent of various diseases among different kinds of animals. A brief account is given of the extent and virulence of 34 infectious or epizootic diseases. Tables are given showing the results of tuberculin and mallein tests and of experiments in preventive inoculation against anthrax.

The relationship between human and bovine tuberculosis, J. McFADYEAN (*Jour. Roy. Agr. Soc. England, 62 (1901), pp. 50–57*).—The author confines his discussion to the question of the identity of human and bovine tuberculosis. Attention is called to reports from children's hospitals in England, from which it appears that as high as 28 per cent of the cases of tuberculosis in children originated in the intestines. Other arguments are presented to support the belief in the identity of the disease in man and animals and in the possibility of its transmission from man to animals or from animals to man.

Transmission of tuberculosis through meat and milk, J. J. REPP (*Reprint from Amer. Med., 2 (1901), Nos. 17, 18, pp. 22*).—The author presents a brief review of the question concerning the identity of human and bovine tuberculosis. From the evidence obtainable from previous experiments of various authors it is argued that tuberculosis may be transmitted from cattle to man, either in the meat or milk of tuberculous animals. Special attention is given to the consideration of the arguments which are opposed to the conclusions of Koch regarding this matter.

Certificate of health, H. LERMAT (*Jour. Agricole [Paris], 12 (1901), No. 141, pp. 203–212*).—Statistical notes are given on the prevalence of tuberculosis of man and its relationship to the same disease among cattle. Copies of regulations for the inspection of milk and dairies in Nice are given. While it is recognized that the milk of cows which react to tuberculin does not necessarily contain the tubercle bacillus, it is highly desirable that all precautions be taken in order to prevent the transmission of the bacilli in the milk and meat of tuberculous cattle.

The infectiousness of milk of tuberculous cows. Bacteriological diagnosis and practical value of tuberculin in the extermination of bovine tuberculosis, LYDIA RABINOWITSCH (*Ztschr. Hyg. u. Infectionskrank., 37 (1901), No. 3, pp. 439–448*).—A critical review of the literature on this subject is given as a basis for a discussion of the practical value of tuberculin and bacteriological study of milk in the extermination of tuberculosis. The author believes that without the use of tuberculin it would be impossible to exterminate tuberculosis in cattle. By thoroughly applying the tuberculin test, all animals which are infected become known and may be separated from the rest of the herd. A study of the milk may then be made among the reacting animals to determine at what time the milk becomes infectious. For this purpose it is necessary to inoculate guinea pigs with the milk of suspected animals.

Further investigations concerning tubercle bacilli in the milk of cows which have simply reacted to tuberculin but do not show clinical symptoms of tuberculosis, R. OSTERTAG (*Ztschr. Fleisch u. Milchhyg., 12 (1901), Nos. 1, pp. 1–5; 3, pp. 72–76; 12 (1902), No. 4, pp. 109–113*).—The author undertook an extensive investigation of the question concerning the presence of tubercle bacilli in the milk of cows in which tuberculosis could not be recognized by clinical symptoms, although the animals reacted to the disease. The experiments involved the selection of 10 cows all of which reacted to tuberculin, inoculation and feeding experiments with the milk of these cows, and subsequent post-mortem examination of all of the cows. Microscopic examination and inoculation experiments with the milk in guinea pigs failed to show a single instance in which tubercle bacilli were present. A number of inoculation experiments were made on guinea pigs, but none of the animals developed any symptoms of the disease or showed evidence of being infected when a microscopic examination was made post-mortem. Feeding experiments with the milk of these cows were undertaken upon guinea pigs, pigs, and calves. The general result of the feeding experiments substantiated that which was previously obtained by the author in similar experiments. It was shown that the milk of cows which simply reacted to tuberculin does not contain tubercle bacilli. This was proved by microscopic examination and by inoculation and feeding experiments with guinea pigs. Further proof was obtained by feeding calves and pigs. In these experiments it was found that calves and pigs could be fed for weeks or even months upon the milk of such cows without becoming infected. The author recognizes that for the prevention of further spread of tuberculosis the most important measure is the extermination of mammary tuberculosis and cases which may be recognized by external symptoms.

Influence of antituberculous serum on the virulence of the tubercle bacillus, F. Arloing (*Compt. Rend. Soc. Biol. Paris, 53 (1901), No. 26, pp. 781–783*).—Two series of experiments were conducted on guinea pigs and rabbits. Guinea pigs which were inoculated hypodermically with 2 drops of an emulsion of tubercle bacilli, grown on potato, were killed and examined for the purpose of determining the extent of infection. Other guinea pigs were inoculated at the same time with 2 drops of emulsion of tubercle bacilli in an antituberculous serum. The development of the disease was more rapid and more extensive in animals which received the antituberculous serum than in those which were inoculated simply with tubercle bacillus. Similar experiments were made on rabbits with similar results. It is concluded that antituberculous serum increases the virulence of the tubercle bacillus and favors the generalization of infection.

The favoring action of antituberculous serum toward infection by the tubercle bacillus in homogenous liquid cultures, F. Arloing (*Compt. Rend. Soc. Biol. Paris, 53 (1901), No. 34, pp. 950, 951*).—Continuing the above work, experiments were made with tubercle bacillus grown on various other media. Rabbits were inoculated with a mixture of cultures of tubercle bacillus and an antituberculous serum in the peritoneum. Similar inoculations were made in the pleura of rabbits. All the rabbits which were inoculated with mixtures of pure cultures and antituberculous serum showed the development of a generalized infection of tuberculosis. Some of them died and others were killed and examined after death for the purpose of determining the extent of the disease. As a result of post-mortem examinations it was found that the antituberculous serum favored peritoneal infection from pure cultures of tubercle bacillus. It is concluded that this serum increases the virulence of the tubercle bacillus, whether inoculated intraperitoneally or hypodermically.

The value and significance of the Arloing-Courmont serum reaction, especially in reference to the early recognition of tuberculosis, M. Beck and Lydia Rabinowitsch (*Ztschr. Hyg. u. Infectionskrank., 37 (1901), No. 2, pp. 205–224*).—Since 1898 a number of articles have been published by Arloing and Courmont in which experiments were reported indicating that cultures of the tubercle bacillus could be brought to agglutination by means of the blood serum of tuberculous animals. The authors undertook an investigation of this subject and the results of their studies are reported in detail in tabular form. The experimental animals included 78 cattle, of which 19 were nontuberculous. Among the 19 healthy cattle the serum reaction was negative in only 1 case; in 2 cases it appeared to develop in a proportion of 1:5; positive in 4 cases in the same proportion; in 4 cases in a proportion of 1:10; in 3 cases in a proportion of 1:20; in 4 cases in a proportion of 1:30; and in 1 case in a proportion of 1:40. The serum reaction in the tuberculous cattle was equally irregular and unsatisfactory, being negative in some cases and positive in others, without any apparent explanation for the irregular results. From these investigations the authors conclude that the method of serum reaction is of little value in diagnosing tuberculosis among cattle; that a positive reaction does not necessarily indicate the presence of tuberculosis; and a negative reaction does not necessarily mean that the animal is free from the disease.

Actinomycosis, W. Silberschmidt (*Ztschr. Hyg. u. Infectionskrank., 37 (1901), No. 3, pp. 345–380, pls. 2*).—A study was made of the pathogenic organisms concerned in a number of cases of actinomycosis in man and cattle. Inoculation experiments were made with purulent material obtained from human and bovine cases of actinomycosis and bacteriological studies were made of the organism obtained from pure cultures from these substances. In the inoculation experiments with actinomycotic material of human origin, rabbits and guinea pigs proved to be almost but not quite resistant. Similar results were obtained from inoculating these animals with material of bovine origin. In all, 8 forms of micro-organisms were obtained from the cases of actinomycosis which were studied. None of these forms corresponded in their morphological characters with the organism described by Boström as the only cause of actinomycosis in man and animals. The author concludes that the assumption that actinomycosis is a specific disease caused by a single parasitic fungus is incorrect. Typical symptoms of the disease may be produced by a number of different micro-organisms. The direct microscopic investigation of the actinomycotic tumors does not suffice for making a certain diagnosis of the disease. In order to identify the micro-organisms it is necessary to make pure cultures. Nearly all of the micro-organisms which were found in cases of actinomycosis in man and animals are considered by the author as belonging to the group Actinomyces.

Germination of anthrax spores, R. Weil (*Arch. Hyg., 39 (1901), No. 3, pp. 205–229*).—The general problem of the biology of the anthrax bacillus was investigated with special reference to spore germination. It was found that when material containing anthrax spores was subjected to favorable conditions for germination, the majority of the spores germinated within a fairly constant period, depending upon the temperature. It was impossible, however, to find a time at which no spores were present in the material, and it is therefore considered impossible to free such material from spores by the method of fractional sterilization. New spore formation took place before the old spores had all germinated. When large masses of spores were brought to the point of germination at an optimum temperature, it was found that only a small number of them germinated, multiplied, and produced new spores. It was impossible to determine the cause of this failure of the majority of spores to reproduce themselves. The germination of a greater number of anthrax spores which were able to develop normally took place as a rule after 8, 16, and 70 hours, at temperatures of 37, 24, and 18° C. respectively. In a few cases germination of spores took place at 0° C. The formation of new spores occurred after 21, 23, 48, and 96 hours, at temperatures of 37, 29, 24, and 18° C. respectively. The germination of anthrax spores was strongly influenced by weak solutions of various chemical reagents. A brief exposure to 1 per cent chloroform, 1.5 per cent aqueous solution of carbolic acid, or 1 per cent solution of formalin, destroyed the germinating power of all spores.

Demonstration of anthrax bacilli, C. Fraenkel (*Hyg. Rundschau, 11 (1901), No. 13, pp. 633–635*).—A report is given on the method adopted by the author for identifying the bacillus of anthrax in 5 suspected cases, of which 3 were in man, 1 in a cow, and 1 in a horse. A microscopic examination of pathological tissue in stained and unstained conditions failed to give a certain diagnosis. Cultures of the material were then made on gelatin and agar media and inoculation experiments were tried on guinea pigs and mice. In the material of bovine origin a demonstration of anthrax bacillus was secured, both through cultures and through inoculation experiments. In the material of human origin the demonstration was successful only in the inoculation experiments in the mouse. In the other cases, where material came from man and from the horse, inoculation experiments gave negative results, while anthrax colonies developed upon the culture media. The author concludes from his experiments that it is desirable to use both the culture and inoculation methods for demonstrating the anthrax bacillus, and that in some cases the inoculation method is the more sensitive test, while in others the culture method is the better.

The relation of the germicidal power of rabbit serum to anthrax infection, M. WILDE (*Ztschr. Hyg. u. Infectionskrank., 37 (1901), No. 3, pp. 476–496*).—As the result of experiments on this subject the author concludes that anthrax bacilli first appear in the blood during the crisis of the disease. At this time, while anthrax bacilli can be readily demonstrated in large numbers in the blood, the germicidal power of the blood is either entirely lost or rapidly disappearing. Besides alexins, there exists in the blood of most rabbits another body, which is antagonistic only to the anthrax bacillus and which is not destroyed by heating for one-half hour at a temperature of 57° C., but requires for its destruction an exposure to that temperature for a period of 24 hours.

Epizootic or contagious abortion, J. McFADYEAN (*Jour. Roy. Agr. Soc. England, 62 (1901), pp. 96–112*).—A general discussion is given to the various conditions which may bring about abortion, but especial attention is given to the contagious form. The means of dissemination of the disease are briefly mentioned and an account is given of some experiments conducted in England on this subject. The disease is of most frequent occurrence in cows, but may become more or less serious in mares and ewes. Strict measures are necessary in order to prevent the spread of the disease when once it has become introduced in herds of cattle, horses, or sheep. The use of disinfectants in such cases is recommended.

Treatment of contagious mammitis in cows, E. ZSCHOKKE (*Jour. Agricole [Paris], 12 (1901), No. 141, pp. 212–214*).—After an extended investigation of the symptoms and pathological anatomy of this disease the author calls attention to the great variation in symptoms and consequent difficulty in reaching a reliable diagnosis in a large number of cases. The experience of the author in artificial treatment of the disease was not very satisfactory, and it is urged that where only one quarter of the udder is affected, this part should not be milked after the disease has developed far enough to be recognized. By milking the affected quarter great danger is presented of transmitting the infection to other parts of the udder. In a large proportion of cases recovery takes place, whether artificial treatment is applied or not, but in cases of spontaneous recovery, as well as in those which are treated, the part of the udder which is affected is likely to become nonfunctional. In a large proportion of cases, therefore, all that can be done is to prevent the spread of the disease to other parts of the udder.

Mortality among calves in Munster, E. NOCARD (*Dept. Agr. and Tech. Instr. Ireland, Bul. 1, 1901, pp. 115*).—This bulletin contains a report by Professor Nocard in French, with a translation into English, upon the subject of "white scour" and "lung disease" among calves in Ireland. The bulletin also contains observations made by A. E. Mettam and T. Wade on the same subject. During these researches it was shown that "white scour" and "lung disease" in calves are different symptoms of one and the same disease. The disease is caused by a specific micro-organism belonging to the genus Pasteurella and identical with that which causes farcinous lymphangitis in horses and caseous broncho-pneumonia in sheep. The micro-organism gains an entrance to calves at the time of birth through the umbilicus, and the proper treatment of the disease should be of a prophylactic nature and should be largely confined to sterilization of the umbilical cord and to disinfection of stables in which the disease has occurred. The symptoms of "white scour" usually appear within a day or two after birth while those of "lung disease" occur considerably later. It had already been observed by stockmen, however, that this particular form of lung disease occurred only in localities where "white scour" was prevalent. The experiments of the authors showed conclusively that the two diseases are identical.

Malaria of cattle in Germany, E. JACKSCHATH (*Centbl. Bakt. u. Par., 1. Abt., 29 (1901), No. 14, pp. 585–589, fig. 1*).—A report is given on the results of observations upon 200 cases of this disease in cattle. It is noted that the disease closely resembles Texas fever, but is apparently somewhat different. Cattle which are native to permanently infected localities become immune to the disease, while cattle which are imported from other localities are subject to acute or chronic attacks of malaria. The symptoms of the disease are similar to those of Texas fever and include a high fever, followed by a period of stupor, and accompanied with a destruction of red blood corpuscles. Death seems to be due to a general anaemia and obstructions to the circulation of the blood in the small blood vessels caused by dissolution of organic material. The author believes that the disease is carried from animal to animal by a common species of cattle tick, *Ixodes reticulatus.*

Description and treatment of scabies in cattle, R. W. HICKMAN (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 40, pp. 23, figs. 15*).—Scabies of cattle is widely distributed on the ranges of the West and Northwest. The disease is known as range itch, cattle itch, and cattle mange or scabies, the latter being most correct. Two forms of the disease occur, one being caused by *Psoroptes communis* var. *bovis.* This form is more frequent on the sides of the neck and shoulders, at the base of the horns, and root of the tail. It may spread to the back and sides and cover nearly all parts of the body. When generally distributed over the skin it may in some cases prove fatal. The mites were found to remain alive and active for 8 to 11 days when kept in a glass bottle at the temperature of living rooms. Exposure to dry sunlight, however, killed the majority of the mites within a few hours. The disease does not usually attack cattle in good condition, especially not after they reach 3 years of age. The animals which are most affected are calves, yearlings, 2-year-olds, and those that are in poor condition.

The other form of scabies is due to *Chorioptes symbiotes* var. *bovis.* This form remains localized in the depressions of the back and at the base of the tail. It is not readily contagious, and yields promptly to treatment. The first-named species is distinguished by its relatively larger size. Notes are given on the life history of this species. The second-named species lives especially on the surface of the skin of the extremities, under epidermic scabs. Sarcoptic mange is more serious than either of the forms already mentioned, but is not common in cattle. This form of mange is transmissible from one species of animal to another. The period of incubation of cattle mange varies according to conditions, from 15 days to from 4 to 6 weeks.

It is important that corrals, sheds, and buildings in which infected animals have been should be thoroughly disinfected. Extensive dipping experiments have been made in North Dakota, and some of the details of these experiments, with drawings of the dipping vats used, were furnished by R. H. Treacy. The dipping material which was used was that known as South African official lime and sulphur dip, and contained 21 lbs. flowers of sulphur, 16¾ lbs. unslaked lime, and 100 gal. water. A second dipping should be administered a few weeks after the first in order to destroy the mites which may have survived the first treatment. Several thousand cattle which had been dipped were carefully inspected without finding any evidence of scabies on them. The dipping liquid should be kept at a temperature of 102° to 110° F., and cattle should be kept in the liquid for 2 minutes. The size and cost of dipping vats will depend upon the number of animals which are to be dipped. A suitable dipping plant for a few farmers may be build for $150, while a swimming tank costs $350 or more. A detailed description with illustrations is given of a large and a small dipping vat for this purpose.

Scabies in cattle, R. W. HICKMAN (*U. S. Dept. Agr., Farmers' Bul. 152, pp. 24, figs. 15*).—A popular edition of the preceding bulletin.

Foot-and-mouth disease, with an account of the outbreak in Suffolk during 1901, E. J. CHENEY (*Agr. Students' Gaz., n. ser., 10 (1901), No. 5, pp. 135-140*).—A brief general account of this disease is presented, with special reference to an outbreak in Suffolk. The first case in this outbreak was reported on January 26, in a herd of cows, and 40 of the animals had to be slaughtered. Further outbreaks occurred at intervals for the next 3 months. All cases of this disease were within a radius of 5 miles. The origin of the infection in the first case was not determined.

Treatment for foot rot, J. COTTON (*Agr. Gaz. New South Wales, 12 (1901), No. 2, p. 1394*).—As a remedy for foot rot in sheep the author recommends a mixture containing ½ lb. copper sulphate, ½ lb. common salt, and 1 qt. of water. The mixture is to be boiled for about 10 minutes in order to dissolve the copper sulphate.

Bots in sheep, J. D. STEWART (*Agr. Gaz. New South Wales, 12 (1901), No. 12, pp. 1542, 1543, pl. 1*).—The sheep bot fly is of comparatively rare occurrence in New South Wales. The symptoms of the disease are given from cases observed by the author and the insect which causes the trouble is described in all its stages. The usual remedies for the disease are recommended.

Immunization against swine plague and hog cholera by means of immune proteidin, H. GREITHER (*Inaug. Diss. Univ. Bern, 1901, pp. 16*).—The author attempted to apply in the treatment of swine plague and hog cholera the method proposed by Emmerich and Löw, according to which immune enzyms are applied in checking the development of contagious diseases. It was found that a bacteriolytic enzym was formed in fluid cultures of swine-plague bacteria and in experiments with this disease inoculation with this enzym had the effect of checking the disease. Similar experiments with hog cholera were not so encouraging. It was found during these experiments that hog-cholera bacteria in bouillon cultures containing nitrates formed large quantities of nitric acid within a short period. It is suggested that this effect might also be produced in the intestines of hogs suffering from hog cholera, and it is therefore recommended that no food containing nitrates be given during the prevalence of this disease.

Pulmonary antisepsis in infectious pneumonia of horses, PRUNEAU (*Rec. Méd. Vét., Paris, 8. ser., 8 (1901), No. 5, pp. 145-155*).—The author discusses the action and effectiveness of various antiseptics which are suitable to be applied in the way of intratracheal injections. The following formula was used in experimental treatment of the disease: Eucalyptol 5 gm., guaiacol 5, menthol 5, essence of thyme 10, essence of wintergreen 10, essence of cinnamon 10, essence of turpentine 30, iodoform 10, pure sterilized olive oil 150. The chemical action of this mixture brings about a disinfection of the respiratory passages, drying of the mucous surfaces, cessation of cough, and a more rapid absorption of medicinal substances by the pulmonary mucous surfaces. The mixture was injected into the trachea by the ordinary method in doses of 20 cc. Experiments on 9 horses indicated that this mixture checks the development of the pathogenic micro-organisms to such an extent that the chances of a rapid and complete recovery are much increased.

Emergency report on surra, D. E. SALMON, C. W. STILES, and A. HASSALL (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 42, pp. 152, pls. 33, figs. 79*).—This report was prepared by the authors in response to a request from the War Department for information concerning surra. The disease recently began to attract attention in the Philippines, where it affects horses, mules, and carabao. The present report is compiled from the literature of the subject, especially from the works of A. Lingard, G. Evans, et al. The report includes a discussion of all the principal problems connected with surra, including etiology, means of infection, pathology, course of the disease, treatment and preventive measures. Notes are also given on the tsetse-fly disease, mal de caderas, and the trypanosoma disease in rats and bandicoots. A bibliography of the literature on this subject occupies pages 131–148.

Cytological modification of the parasitized animal cell, P. Dormoy (*Bul. Soc. Sci. Nancy, 3. ser., 2 (1901), No. 2, pp. 68–72*).—Different conditions have been found by different authors in work on the problem of the effect of parasitism in animal cells. In some cases the presence of the parasite causes great changes, hypertrophy, and degeneration; in others, the parasite appears to remain in the cell without causing any recognizable disturbance. The differences in the conclusions deduced from this study by different authors probably depend on differences in conditions under which the studies were made. In the author's investigations special attention was given to the study of *Karyophagus salamandræ*. It was found that parasitized cells were not modified, that the cytoplasm did not differ from that of unparasitized cells, and that no hypertrophy took place in the nucleus. In some cases it is believed that as soon as cells become parasitized they begin the secretion of a digestive enzym, and that the parasitic organism antagonizes this substance to a greater or less extent by the secretion of a substance which has a tendency to neutralize the enzyms.

Notes on parasites, M. G. Tartakovski (*Arch. Vet. Nauk, St. Petersburg, 31 (1901), No. 11, pp. 1043–1049*).—The author discusses the occurrence of surra in gray rats. *Trypanosoma lewisi* was found in the blood *Mus decumanus* and *M. sylvaticus*. Notes are given on the occurrence of *Trichosoma tenuissimum* and *Filaria clara* in pigeons. Species of lung worm were found causing serious disease among rabbits (*Lepus variabilis* and *L. timidus*). The species of lung worm chiefly concerned in causing infestation among rabbits is *Strongylus commutatus*.

The method of adhesion of certain parasitic nematodes to the intestinal walls of mammals, A. Rizzo (*Atti R. Accad. Lincei. Rend. Cl. Sci. Fis. Mat. e Nat., 5. ser., 10 (1901), I, No. 8, pp. 309–317, figs. 3*).—The author studied the mode of attachment of a number of species of nematode worms to the intestines of mammals, and also the effect produced by the presence of these parasites in the alimentary tract. The species upon which most work was done were *Sclerostomum tetracanthum* and *Trichocephalus affinis*. A description is given of the organs by means of which the worms secure their hold upon the wall of the intestines, and anatomical details are presented concerning the pathological effects of the irritation set up by the presence of the worm.

The button disease of chickens (*Jour. Agr. Trop., 1 (1901), No. 6, pp. 172–174; reprint from Bul. Union Agr., Caledon., 1901, Oct. 20*).—In the tropical countries a disease of young chickens characterized by the appearance of button-like tubercles at the angle of the mouth is comparatively frequent. This disease is due to a parasitic fungus and is considered a kind of aspergillosis. The parasitic fungus is normally present in the soil and on various grains, especially rice. In preventing the disease it is recommended that all rice should be disinfected before being fed to young chickens. As a treatment for the button disease it is recommended that the tubercle be removed and that the raw surface thus exposed be painted with tincture of iodin. In all cases in which this treatment was applied in the early stages of the disease complete recovery was brought about.

Vaccination and serum therapy in roup, C. Guérin (*Ann. Inst. Pasteur, 15 (1901), No. 12, pp. 941–952*).—An organism was isolated from chronic cases of roup in chickens and was found to be of slight and variable virulence. Taken from the first culture it would kill pigeons or chickens, but would produce no disturbance when inoculated in large doses from the second culture. In order to increase the virulence of the organism for experimental purposes, it was repeatedly inoculated into the lower eyelid of pigeons, and after several generations the virulence was found to be much increased. After passing twelve times through pigeons in this manner it was of sufficient virulence, in doses of ¼ cc., to kill pigeons in 18 hours when inoculated in the conjunctiva of the eyelid. Still further operations of this sort rendered the organism of sufficient virulence to kill rabbits, chickens, and other small experimental animals. Notes are given on the pathological changes produced by inoculations of the organisms. During these experiments the same symptoms were produced as those observed in cases of natural infection. It was found possible to vaccinate chickens against roup by means of 2 injections. The first injection was made with a virulent culture 24 hours old in bouillon after heating to a temperature of 55° C. for 1 hour. The organism is killed by this process. The second injection should follow 12 hours after the first, and should be made with a virulent culture of the same age, exposed for 1 hour to a temperature of 50° C. Both injections are made in doses of ½ cc. Within from 12 to 15 hours after the second inoculation the animal possesses complete resisting power to fatal doses of the virulent organism.

From horses which were previously immunized a serum was obtained of remarkable antitoxic power. Two inoculations of the serum are necessary at intervals of 24 hours.

The relation of the agglutinins to the protective bodies, A. Castellani (*Ztschr. Hyg. u. Infectionskrank., 37 (1901), No. 3, pp. 381–392*).—For studying the relationship between these two substances the author made experiments on rabbits, using the bacillus of dysentery. It is concluded that the agglutinating substance and protective bodies react in the same manner toward chemical and physical influences. There is no parallelism between the development of the agglutinating and immunizing power in the living body. In immunized animals during the first few days the serum is always richer in agglutinins than the spleen, while the spleen contains more of the protective bodies. The author believes that the view that a close relationship exists between the protective and agglutinating substances must be abandoned.

Comparative experiments on the reliability of different methods of disinfecting by means of formaldehyde, A. Reischauer (*Hyg. Rundschau, 11 (1901), No. 13, pp. 636–655*).—The author conducted extensive experiments with various forms of apparatus which have been recommended for producing formaldehyde gas for disinfecting purposes. From these experiments it is concluded that there is a large variety of apparatus by which formaldehyde gas may be generated in sufficient quantity and distributed uniformly in an active condition throughout the space to be disinfected. The generation of the gas is not very expensive. It is apparent, however, that the general application of this method of disinfection has two disadvantages, in that formaldehyde gas is not capable of destroying bacteria in the spore form, and does not penetrate clothing, carpets, and other similar material to an extent which renders certain the destruction of bacteria in such situations. A bibliography of 156 titles is appended to the article.

The grass pea (Lathyrus sativus), F. T. Shutt (*Canada Expt. Farms Rpts. 1901, pp. 183–185*).—A request was made of the chemist to investigate statements which have obtained some currency to the effect that the grass pea possesses poisonous qualities. In times of famine, when the natives of India live largely upon the seed of this pea, a disease develops, apparently as a result of this diet, which is known as lathyrismus. Careful analyses were made by the author of considerable quantities of the seed of this pea, but all results were negative, no alkaloid or other poisonous principle being found. A feeding experiment was then conducted with a rooster and hen which were fed almost exclusively on grass peas for a period of 72 days. The fowls ate on an average from 2½ to 2¾ oz. per day. No poisonous effects were produced by this diet, and all data collected by the chemist indicate that the grass pea raised in Canada is not poisonous.

Index-catalogue of medical and veterinary zoology, C. W. Stiles and A. Hassall (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 39, pt. 1, pp. 46*).—In this part of the bulletin a beginning is made of the publication of the card index in the zoological division of the Bureau. It is arranged alphabetically according to authors and includes all authors' names beginning with A. The subjects covered by the catalogue are along the lines of medical and veterinary zoology. The hope is expressed that subsequently a subject catalogue of this material may be published.

AGRICULTURAL ENGINEERING.

The engineering of agriculture, O. V. P. Stout (*Agriculture* [*Nebraska*], *1902, June, pp. 5–10*).—This article discusses briefly the need and opportunities for investigation along the following lines: Irrigation and drainage; road making; water supply and sewerage engineering; landscape gardening; the use of steam, electric, water, and wind power; construction of farm buildings, bridges, etc.; heating, ventilation, and refrigeration; prevention of erosion; the mechanical principles of draft; and machine construction.

Irrigation at the station farm, 1898–1901, A. J. McClatchie (*Arizona Sta. Bul. 41, pp. 48, figs. 4*).—This bulletin discusses the available water supply, soil of the station farm, season of growth, rainfall during the years covered by the experiments, temperature and relative humidity, evaporation, method of measuring water, the importance of using water economically, the amounts of water applied during different years, and the methods used in irrigating alfalfa, beets, cabbages, corn, cowpeas, grain, grapes, melons, onions, orchards, peas, potatoes, pumpkins and squashes, sorghum, strawberries, tomatoes, and small garden vegetables. The water supply of this region (the Salt River) is irregular, being smallest in summer when most needed, thus emphasizing the need of storage reservoirs to equalize the flow. "Without storage reservoirs, the most rational procedure is to store in the soil during the periods of heavy river flow, as much water as practicable, and to irrigate all crops in the most economical manner during periods of scarcity."

The average rainfall is about 7 in., but was below the average for the period covered by the experiments here reported. "With the exception of a few of the rains of winter, local rains are seldom of direct benefit to crops, and in many cases are a decided injury. . . . The mean annual temperature at the farm has been 68 to 69° F., during the past 4 years, and the mean relative humidity 33 to 37. The total evaporation from a water surface for the one year during which a record has been kept was 65.6 in., evaporation being most rapid during July, and slowest during December and January. . . . The total amount [of water] used upon the station farm during 1901 was approximately 6 acre-feet per acre, more than necessary being applied during winter, and the available supply during summer being inadequate. Of the crops of which a record was kept during 1900, barley received the smallest amount of water, and onions the greatest. Of the crops grown during 1901, potatoes received the smallest amount of water, and strawberries the greatest. . . . Orchards and vineyards need irrigation throughout the summer, when young; but when established, most of the water needed by them may be applied during winter."

Irrigation in the East (*Forestry and Irrig., 8* (*1902*), *No. 7, pp. 298–300*).—A brief summary of statistics from the Twelfth Census showing the extent of irrigation in Maine, Massachusetts, Connecticut, Rhode Island, New Jersey, New York, and Pennsylvania.

Irrigation and rice growing in Louisiana (*Forestry and Irrig., 8* (*1902*), *No. 9, pp. 366–370, figs. 2*).—A brief account of the recent rapid growth of the rice industry in Louisiana, due mainly to the introduction of improved methods of irrigation.

The distribution of water. Powers and duties of irrigation officials in Colorado, H. N. Haynes (*Colorado Sta. Bul. 67, pp. 31*).—This bulletin consists of two lectures delivered before the short course for irrigation officials at the Colorado Agricultural College in the spring of 1901, which give a summary of useful information on this subject.

Diagrams of mean velocity of uniform motion of water in open channels; based on the formula of Ganguillet and Kutter, I. P. CHURCH (*New York: John Wiley & Sons; London: Chapman and Hall, Ltd., 1902, pp. 25*).

Dynamometer tests with farm implements, C. W. BURKETT and F. S. JOHNSTON (*New Hampshire Sta. Bul. 87, pp. 122–124*).—Tests of draft of old and modern types of walking plows, disk and spring-tooth harrows, corn binders, and farm vehicles (wagons, carts, and sleds) under different conditions are briefly reported.

The cool side of a house in Arizona, S. M. WOODWARD (*Arizona Sta. Bul. 42, pp. 49–57, fig. 1, chart 1*).—This bulletin shows how the heating effect of the sun may be minimized by attention to size and shape of the building, materials used, method of construction, external protection, etc. According to the calculations given the dimensions of a house which shall receive the minimum amount of heat should bear about the following relations to each other: Breadth (north and south) 2.36, length (east and west) 8.82, height 8.45.

Ventilation of farm stables and dwellings, J. B. REYNOLDS (*Ontario Agr. Col. and Expt. Farm Bul. 119, pp. 24, figs. 16*).—This bulletin includes a general discussion of the subject and details of methods actually in use. (See also E. S. R., 13, p. 1104).

Granaries arranged for mechanical handling of the grain, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 4 (1902), Nos. 33, pp. 213–218, figs. 5; 34, pp. 250–252, figs. 4*).

The mordern silo, C. S. PLUMB (*Indiana Sta. Bul. 91, pp. 83–106, figs. 5*).—This bulletin explains the advantage of the round silo and gives details of construction of several kinds of round silos, including the Wisconsin round silo, the stave or tank silo, brick or stone silos, and cement or grout silos.

MISCELLANEOUS.

Fourteenth Annual Report of Massachusetts Station, 1901 (*Massachusetts Sta. Rpt. 1901, pp. 219*).—This contains a brief summary of station work during the year, a financial statement for the fiscal year ended June 30, 1901, and reports of the agriculturists, botanists, entomologists, meteorologist, and chemists, outlining in detail the work of their respective departments, and containing articles noted elsewhere.

Thirteenth Annual Report of New Hampshire Station, 1901 (*New Hampshire Sta. Bul. 87, pp. 111–135*).—This includes a financial statement for the fiscal year ended June 30, 1901, and reports of the vice-director and heads of departments, reviewing the different lines of station work during the year ended October 31, 1901. Parts of the report are noted elsewhere. The report of the chemist contains analyses of 4 samples of drinking water and 7 samples of meadow muck.

Twelfth Annual Report of New Mexico Station, 1901 (*New Mexico Sta. Rpt. 1901, pp. 21–42*).—This includes a brief report of the work of the station during the year, a list of station bulletins, reports of the heads of departments, and a financial statement for the fiscal year ended June 30, 1901.

Crop Reporter (*U. S. Dept. Agr., Division of Statistics Crop Reporter, Vol. 4, Nos. 1–3, pp. 8 each*).—These numbers contain statistical data on the condition of crops in the different States and Territories on May 1, June 1, and July 1, 1902; statements concerning the condition of crops in the principal foreign countries; and miscellaneous articles of a statistical nature, among which are the following: Growth of the sugar industry in Hungary, flax fiber in Michigan, changes in market for horses, transportation of milk and cream to New York City, cane sugar production in Cuba.

Agricultural experiment stations and kindred institutions in Europe, C. A. ZAVITZ (*Ontario Agr. and Expt. Union Rpt. 1901, pp. 55–58*).—Notes are given on agricultural education and investigation in France, Switzerland, Germany, Austro-Hungary, Holland, Belgium, and Great Britain, which were visited by the author in 1901.

NOTES.

Alabama Tuskegee Station.—During the past summer the station set out 300 mulberry trees with a view to making experiments in silk culture in the future.

California University and Station.—J. Burtt Davy, assistant in botany, has resigned to accept the position of assistant curator in the Bureau of Plant Industry of this Department. Gen. W. H. L. Barnes, a member of the governing board of the university and station, died in San Francisco July 21, 1902.

Delaware College and Station.—E. Dwight Sanderson, entomologist, has resigned to accept the position of State entomologist in Texas.

Florida College and Station.—C. M. Conner, of the South Carolina College and Station, has been elected professor of agriculture in the college and agriculturist of the station, and has entered upon his new duties.

Georgia College and Station.—H. N. Starnes, formerly horticulturist of the station, and for the last three years professor of agriculture in the college, has returned to the station to fill the vacancy caused by the resignation of S. H. Fulton, who has come to this Department.

Illinois College and Station.—E. B. Forbes has been appointed assistant in animal husbandry.

Purdue University and Station.—H. A. Huston, chemist of the station, has been appointed director to succeed C. S. Plumb. A. N. Hume, assistant agriculturist, has resigned to accept a position in the Winona Agricultural and Technical Institute, Winona Lake, Indiana.

Iowa College and Station.—P. G. Holden, B. S. A., formerly of the Illinois College and Station, has recently been elected professor of agronomy and vice dean of the division of agriculture. J. J. Edgerton, instructor in agricultural physics, has resigned to accept a position on the *Prairie Farmer*, published in Chicago. W. H. Stevenson has been elected assistant in soils. Mr. Stevenson is a graduate of Illinois College and has been doing advanced work in the University of Illinois. W. H. Olin, M. S. A., has been made assistant in agronomy.

Kansas College and Station.—At a recent meeting of the board of regents the work in agriculture was divided into three chairs—agriculture, animal husbandry, and dairying. A. M. Ten Eyck, of the North Dakota College and Station, was elected professor of agriculture; D. H. Otis, of the chair of dairy husbandry, was made professor of animal husbandry; and E. H. Webster, assistant in dairying, was made professor of dairying. C. L. Barnes, of the Washington Agricultural College, recently appointed assistant in the veterinary department, was made assistant professor. Theo. H. Scheffer was appointed assistant in zoology, W. F. Coover assistant in chemistry, and Roscoe H. Shaw assistant chemist of the station.

Kentucky College and Station.—L. O. Beatty, assistant chemist of the station, has resigned to accept a fellowship in Columbia University; and T. L. Richmond, assistant entomologist and botanist, has resigned to accept a position with the department of agriculture of the Philippines. The station has begun the erection of a large dairy barn. It will be in the Swiss style of architecture and consist of a main portion and two wings. One wing will contain 30 stalls for milch cows and the other will accommodate an equal number of young cattle. The college has begun the erection of a girls' dormitory to cost $60,000.

MAINE STATION.—The station council has recently been enlarged by the appointment of a member from the State Dairymen's Association, Rutilus Alden, of Winthrop, Me.

MARYLAND COLLEGE AND STATION.—C. F. Austin, of the Alabama Experiment Station, has been appointed associate horticulturist to succeed E. P. Sandsten, who has resigned to go to Wisconsin.

MASSACHUSETTS STATION.—Thorne M. Carpenter, recently appointed assistant in the department of foods and feeding, has resigned to accept a position at the Pennsylvania Station.

MISSOURI STATION.—E. L. Shaw, B. S. (Ohio State University), has been appointed assistant in agriculture to the station, vice T. I. Mairs.

MONTANA COLLEGE AND STATION.—For some months past tests for salicylic acid in various fresh fruits have been carried on in the chemical laboratory by F. W. Traphagen and Edmund Burke, with the result of showing the almost constant presence of this acid in extremely small quantity. It is has been found in the following fruits, among others: Strawberries, raspberries—both red and black, blackberries, currants, plums, black cherries, apricots, peaches, Concord grapes, apples, crab apples, and oranges; and also in tomatoes, cauliflower, and string beans. In a few instances quantitative determinations have been made. The amount found in currants, for example, was 0.57 mg. per kilo of fruit, in cherries 0.40, in plums 0.28, in crab apples 0.24, and in grapes 0.32 mg. These values are not regarded as absolute, but represent the amounts which have been extracted. This work is thought to have an important bearing particularly on the investigations of food chemists. F. B. Linfield, of the Utah College and Station, has been elected professor of agriculture in the college and agriculturist of the station, to succeed Robert S. Shaw. Professor Linfield will enter upon his new duties November 1. A frame dairy building, 24 by 44 ft. and two stories high, is nearly completed. The lower floor will be used for butter and cheese making, the dairy having a capacity of about 1,000 gal. of milk a day, and the upper floor will be used for class rooms. The equipment is on the ground and will be installed as soon as the building is completed. The cost of the building is about $2,500, the amount appropriated by the last legislature.

NEBRASKA UNIVERSITY AND STATION.—Henry B. Slade, assistant chemist of the station, has recently been elected chemist of the Idaho Station. Samuel Avery has been appointed professor of agricultural chemistry and chemist of the station. The university has added a course in forestry, to be opened this year. It is four years in length, and the conditions for admission are the same as to other courses of the university.

NEVADA UNIVERSITY AND STATION.—Gordon H. True, of Arizona University and Station, has been elected to the chair of animal husbandry in this university and station.

NEW MEXICO STATION.—Popular interest in the experimental work of irrigating from wells is increasing and is reported greater than in any former work which the station has undertaken. The work of the station so far as it has been carried shows that in the Messilla Valley at least the amount of underground water available is much greater than was previously considered possible. This water is of good quality for irrigation and is reached at a depth of 20 ft. and lower. A well 48 ft. deep and supplied with a 6-in. pipe has yielded a steady flow of a little more than 800 gal. a minute, which was maintained for a continuous run of 30 hours with no apparent diminution in the available supply. Using wood at a cost of $2.25 a cord, it was found that the cost of irrigating land with an amount of water sufficient to cover it 3 in. deep amounted to about 58½ cts. an acre. A series of tests with various pumps under varying conditions and with a variety of fuel is in progress.

NEW YORK STATE STATION.—V. A. Clark, formerly connected with the Office of Experiment Stations and more recently engaged in commercial work in the West, has been appointed first assistant horticulturist of the station, in place of N. O. Booth, who has resigned to become horticulturist in the Washington College and Station. H. O. Woodworth has been appointed assistant entomologist of the station to succeed P. J. Parrott, who went to the Ohio Station some months since.

NORTH CAROLINA COLLEGE AND STATION.—W. R. Morehouse, a graduate of the Lowell (Mass.) Textile School, has been elected instructor in chemistry and dyeing in the college; J. S. Kendall, a graduate of the New Hampshire College, has been appointed instructor in dairying in the college and assistant in dairying in the station; and T. J. McLelland, a graduate of the Ohio State University, instructor in soil physics and agronomy in the college. F. L. Stevens, professor of biology in the college, has been made biologist to the station. H. P. Richardson has resigned his position as poultryman to the station.

OHIO COLLEGE AND STATION.—J. Fremont Hickman, agriculturist to the station, died October 22 of typhoid fever. He had been in poor health for several months from overwork, and during the early part of summer was obliged to give up his work for a time, but returned somewhat improved. Professor Hickman was a native of Ohio, where he was born July 3, 1856. He graduated from Pennsylvania State College in 1880, and from 1881 to 1883 was superintendent of one of the experimental farms which the college operated at that time. For several years he followed farming and sheep raising at his home in East Liverpool, Ohio, and in 1888 became connected with the Ohio Station, then located at Columbus. He took a prominent part in laying out the farm and extensive plat system when the station moved to Wooster, and had since been in immediate charge of this work, together with the keeping of the records. He was a conscientious, systematic, and thorough worker in the lines which he undertook, and gave unusually close personal attention to all important details. His death will be a severe loss to the station. Alfred Vivian, assistant chemist of the Wisconsin University and Station, has been elected associate professor of agricultural chemistry in the College of Agriculture of the Ohio State University. A. F. Burgess, chief inspector of nurseries, and Ida L. Feiel, assistant botanist, are no longer connected with the station.

OKLAHOMA COLLEGE AND STATION.—L. A. Meerhouse, a graduate of the Ontario Agricultural College, has been appointed assistant in soils and crops in the college and station. The college announces a short course in agriculture, horticulture, and mechanic arts, designated as "a business course for farmers," which will extend from January 6 to February 27, 1903. Special efforts are being made to advertise the school in order to reach the progressive farmers and farmers' sons of the Territory. The course offered is quite comprehensive in character, and the total expense of attendance is estimated at less than $30.

PENNSYLVANIA COLLEGE AND STATION.—Harry Hayward, assistant professor of dairy husbandry and dairy expert of the station, has resigned to become associate professor of animal industry and dairying in the New Hampshire Agricultural College. The instruction in practical dairying has been temporarily assigned to T. I. Mairs. M. S. McDowell, assistant chemist of the station, has resigned to accept a position with the Newport Fertilizer Company. N. W. Buckhout, assistant chemist, has also severed his connection with the station. Dr. H. P. Armsby has been relieved from duty as dean of the School of Agriculture in order to enable him to give more exclusive attention to the work of research and investigation, especially that branch which the station is now carrying on in cooperation with this Department through the operations of the respiration calorimeter. Wm. A. Buckhout has been provisionally appointed acting dean.

PORTO RICO STATION.—The station has removed from Rio Piedras to Mayaguez, where it has taken possession of the land recently purchased for its use through an appropriation of $15,000 made by the last legislative assembly of the island. The farm contains 230 acres, and cost $19,000, the $4,000 additional to the appropriation being given by the municipality of Mayaguez. The old sugarhouse on the place has been repaired and painted, and will serve the present needs of the station for office, laboratory, and working quarters. The 11-room frame house has also been put in condition and serves as living quarters. In addition to these buildings there is a brickyard with several kilns and drying sheds; also a number of small huts in which peons live. The place presents a considerable variation in character of soil, topography, and exposure. It is well located with reference to the city of Mayaguez, and although in a neglected condition it presents very good possibilities and is well suited to the needs of the station. Paul A. English has been appointed assistant agriculturist, in place of James Mackinlay. J. W. Van Leenhoff, a coffee planter from Java, has been appointed coffee expert.

SOUTH CAROLINA COLLEGE AND STATION.—P. H. Mell, formerly professor of botany in the Alabama College and director of the station, was elected president of the Clemson College and director of the South Carolina Station early in September. H. Benton, formerly director of the Alabama Canebrake Station, has been installed as assistant professor of agriculture and assistant agriculturist to succeed C. M. Conner, who has gone to Florida.

TEXAS COLLEGE AND STATION.—At a meeting of the board of directors held early in September the following vacancies in the college and station were filled: W. D. Gibbs, formerly professor of agriculture in the New Hampshire College and director and agriculturist of the New Hampshire Station, was appointed dean of agriculture in the Texas College and director of the station. He entered upon his new duties September 8. F. S. Johnston, formerly associate professor of agriculture in the School of Agriculture of the Purdue University, was appointed professor of agriculture in the college. E. C. Green, chief inspector of orchards in Illinois, was appointed assistant horticulturist of the station and instructor in horticulture in the college. O. C. Hargis, a graduate of the Texas University, was appointed assistant chemist. The new chemical-veterinary building, costing $31,000, is nearing completion. This will provide adequate accommodations for these two departments, which heretofore have been cramped and unsuitable.

UTAH STATION.—William N. Hutt, B. S. A., of the Department of Agriculture of Ontario, has been elected horticulturist of the station. Professor Hutt has been employed as lecturer at farmers' institutes in Ontario for the last four years, and in 1901 was appointed special lecturer in nature study to the schools and horticultural societies of Ontario. Before taking up the present position he was secretary of the horticultural societies at the Department of Agriculture of Ontario.

WASHINGTON COLLEGE AND STATION.—Geo. Severance, instructor in agriculture in the Michigan Agricultural College, has been elected instructor in agriculture in this college and assistant agriculturist of the station.

WEST VIRGINIA UNIVERSITY AND STATION.—S. W. Fletcher, recently of the Washington College and Station, has been elected horticulturist to fill the vacancy made by the retirement of K. C. Davis; and W. M. Morgan, a graduate of Cornell with the degree of B. Sc. A., has been made assistant horticulturist of the station.

CONVENTION OF AMERICAN VETERINARY MEDICAL ASSOCIATION.—The thirty-ninth annual meeting of this association was held in the assembly room of the West Hotel in Minneapolis, September 2–5, 1902. The attendance was unusually large, and the discussion of the papers which were read and the resolutions which were adopted was enthusiastic. The meeting was counted one of the most successful in the history of the association. The president, J. F. Winchester, delivered an address on the history of the association, in the course of which special emphasis was laid on the necessity of longer and more thorough veterinary courses in colleges. The committee on intelligence and education recommended greater uniformity in veterinary curricula and supervision of instruction in all colleges. In accordance with these views a resolution was passed instructing the committee on intelligence and education to examine into the organization of veterinary colleges and State examining boards. The committee on diseases gave in its report a résumé of present knowledge concerning anthrax. It was stated that protective vaccination has been found very effective. Live animals are considered more likely to spread infection than carcasses. The committee on army legislation reported failure in securing the desired legislation for army veterinary service, and it was suggested that for the present little hope could be extended for introducing any change in the organization of the veterinary corps of the Army. The State secretaries of the association reported a very satisfactory condition of the State veterinary associations and of veterinary work in the various States.

J. J. Repp read a paper on Ulcerative Anovulvitis of Cattle. The disease may occur in a mild or a severe form, resulting sometimes in death. In males the anus only is affected. The disease spreads rapidly, so as to include the whole herd. The period of incubation appears to be about one week. The ulcers are not deep, the lymphatic glands are somewhat swollen, and the symptoms as a whole render the disease easily differentiated from exanthema. The mortality in the experience of Dr. Repp was about 2 per cent. Treatment may be of a curative or preventive nature. Affected animals may be treated by disinfection and antiseptic washes. Heifers affected with the disease are rendered unfit for breeding purposes.

S. D. Brimhall read a paper on Hemorrhagic Septicæmia in Cattle. The disease is due to *Bacillus bovisepticus*. Details were given on the isolation and culture of the organism. The disease may resemble anthrax, blackleg, or poisoning, but can be differentiated by microscopic examination. It is usually of sudden termination, and little opportunity is given for treatment. Carcasses should be burned. About 80 outbreaks were reported from Minnesota, and the disease is known in South Dakota and Wisconsin. The chief symptoms were swelling in various parts of the body and bloody discharges from the intestines, with temperature varying from 98 to 106° F. The author believed that so-called cornstalk disease was in a large percentage of cases to be included under hemorrhagic septicæmia.

C. Schmitt discussed Barrenness in Bovines, reviewing the various causes of sterility, and suggesting remedies which have proved successful in his practice; and W. C. Rayen considered Texas Fever and its Relation to the Live Stock Interests of Tennessee. The topography of Tennessee in relation to the distribution of Texas fever was described in detail. The author spoke of annoying defects in the stock laws of the State. As a means of combating Texas fever the destruction of ticks was recommended, as well as other quarantine measures.

F. A. Rich discussed the subject of Equisetum Poison, which will be noted later from his report in Vermont Station Bulletin 95; and N. S. Mayo presented a paper on Poisonous Stock Foods. Poisonous plants were divided into two classes, those causing immediate effects and those whose effects are manifested only after some time. Brief notes were given on various ptomaines and alkaloids as well as chemical substances, such as nitrate of potash, silica, etc., which may be taken up from the soil. A number of serious cases of poisoning were mentioned which were attributed to *Rumex altissimus*, blue vervain, flaxseed chaff, common yarrow, and cockleburs. The tall dock is thought to have caused the death of 42 cattle, 3 calves died apparently from eating blue vervain, 6 colts from eating yarrow, and a number of hogs from eating cockleburs. Thirty-seven hogs were also reported to have died from eating too much rye.

Malaria in the Horse was the subject of a paper by F. Torrance. The disease exists in Manitoba, Minnesota, and North Dakota. It is characterized by a progressive anemia, and animals may die in from 2 weeks to 3 or 4 months. The mucous membranes are pallid and the legs and undersurface of the body become swollen.

It was not discovered how the disease is spread. Inoculation experiments were with negative results. The disease is most prevalent in summer and fall. Native horses are equally susceptible with imported breeds, and one attack does not confer immunity. Prognosis is unfavorable, and the mortality is 50 per cent or greater. The red blood corpuscles are reduced to 2,000,000 per cubic centimeter of blood. No hematozoa were found in the blood. A micro-organism was discovered which may prove to be the cause of the disease. Quinine, arsenic, vegetable tonics, and other remedies have proved unsatisfactory. Intestinal antisepsis gave promising results.

C. C. Lyford described the Differential Diagnosis between Farcy, Furunculus, and Bursattee. Bursattee was said to affect chiefly the epithelia and mucous membranes and to be essentially a warm-weather disease. Moisture favors the development of the sores. Farcy may be superficial or deep, and affects the lymphatic glands. It is further differentiated from bursattee by the exudation of pus from the sores.

J. C. Norton discussed the results of strict sanitary regulations in Arizona, giving special attention to the control of Texas fever, hog cholera, and other infectious diseases, and mentioning peculiar difficulties in enforcing the laws in that Territory. L. Pearson discussed the organization of State veterinary work, calling attention to the great importance of animal industry and to the numerous mistakes which have been made in veterinary legislation. It was argued that the best results were obtained when the work was largely under the direction of veterinarians. Special stress was laid on the value of well-equipped laboratories for the use of State sanitary boards.

A resolution was adopted requiring the State veterinary associations to make their conditions for membership the same as the national association; and another recommending that the clinics at the meetings of the association be enlarged and made to include exhibitions of pathological specimens, etc.

The fourth day of the meeting was spent at the veterinary building of the University of Minnesota in attendance upon clinics illustrating operative and other treatment for various diseases.

The officers elected for the ensuing year were as follows: President, S. Stewart; vice-presidents, J. G. Rutherford, W. H. Dalrymple, E. M. Ranck, M. E. Knowles, and M. H. Reynolds; secretary, J. J. Repp; and treasurer, W. H. Lowe.

The members of the Association of Experiment Station Veterinarians held an informal meeting and after a brief discussion decided to allow that organization to lapse. The meetings of the organization have been held in connection with those of the national association, and since the papers read at both meetings are of similar nature, it was thought best to combine all of this work rather than to attempt to maintain two distinct organizations.

American Park and Outdoor Art Association.—The sixth annual meeting of this association was held in Boston, August 5–7. Addresses on a wide range of subjects connected with landscape architecture and civic improvement were presented and a relatively large space on the program was devoted to the subject of Gardening for Children. Mr. Dick J. Crosby, of this Office, introduced the subject in an address Tuesday evening on The School Garden Movement. On Thursday afternoon the entire session was devoted to the discussion of various phases of this movement as outlined in the following list of topics and speakers: The School Garden as a Phase of Industrial Work, W. A. Baldwin, Principal State Normal School, Hyannis, Mass.; Boston Sand Gardens, Ellen M. Tower, Lexington, Mass.; School Gardens at the Hartford School of Horticulture, H. D. Hemenway, Director, Hartford, Conn.: The National Cash Register Boys' Gardens, George A. Townsend, jr., Dayton, Ohio; Some Neglected Millions, George Henry Knight, New York City; How we Reach Eighteen Thousand School Children in New York, J. W. Spencer, Supervisor Bureau of Nature Study, Cornell University, Ithaca, N. Y.; Nature Study for Children, George T. Powell, Director School of Practical Agriculture and Horticulture, Briarcliff Manor, N. Y.

The widespread interest in this phase of education, as indicated in the large attendance at this session, led to the appointment of the following committee on school grounds charged with the preparation of a report and program for the meeting in Buffalo next year: Dick J. Crosby, Washington, D. C., chairman; Mrs. Mary Morton Kehew, Boston, Mass.; H. D. Hemenway, Hartford, Conn.; J. W. Spencer, Ithaca, N. Y. The officers of the association for the current year are: President—Clinton Rogers Woodruff, Philadelphia, Pa.; vice-presidents—John C. Olmsted, Brookline, Mass.; Mrs. Herman J. Hall, Chicago, Ill.; Chas. W. Garfield, Grand Rapids, Mich.; Warren H. Manning, Brookline, Mass.; Dick J. Crosby, Washington, D. C.; W. Ormiston Roy Montreal, Canada; secretary—Chas. Mulford Robinson, Rochester, N. Y.; treasurer—Ossian C. Simonds, Chicago, Ill.

PERSONAL MENTION.—Major John Wesley Powell, director of the U. S. Bureau of Ethnology of the Smithsonian Institution, and formerly director of the U. S. Geological Survey, died at Haven, Me., September 23, 1902. Major Powell was born at Mount Morris, N. Y., March 24, 1834. He rendered distinguished service in the civil war, in which he was severely wounded, losing an arm. After the war he was made professor of geology, first at Wesleyan University, Bloomington, Ill., and afterwards at Northern University, Illinois. In 1868 he explored the Colorado canyon, traversing its whole length in boats. As a result of this and subsequent explorations the U. S. Geographical and Geological Survey of the Rocky Mountain Region was established in 1870, which in 1879 was combined with the Hayden, King, and Wheeler surveys to form the present U. S. Geological Survey. Major Powell was director of this from 1880 to 1894, when he resigned. While director he evolved a plan for the irrigation of the arid lands of the United States, which resulted in the organization of an Irrigation Survey under authority of Congress in 1888, and the subsequent investigations of the U. S. Geological Survey on the water supply and the extent to which the arid lands can be reclaimed by irrigation.

In the course of the inaugural address of Prof. James Dewar, president of the British Association, at the Belfast meeting, the speaker referred to the services to agricultural science of the late Sir Joseph Henry Gilbert in the following terms: "He strove with conspicuous success to place the oldest of industries on a scientific basis, and to submit the complex conditions of agriculture to a systematic analysis. He studied the physiology of plant life in the open air, not with the object of penetrating the secrets of structure, but with the more directly utilitarian aim of establishing the conditions of successful and profitable cultivation. By a long series of experiments, alike well conceived and laboriously carried out, he determined the effects of variation in soil, and its chemical treatment—in short, in all the unknown factors with which the farmer previously had to deal according to empirical and local rules, roughly deduced from undigested experience by uncritical and rudimentary processes of inference. Gilbert had the faith, the insight, and the courage to devote his life to an investigation so difficult, so unpromising, and so unlikely to bring the rich rewards attainable by equal diligence in other directions, as to offer no attraction to the majority of men. The tabulated results of the Rothamsted experiments remain as a benefaction to mankind and a monument of indomitable and disinterested perseverance."

We note from *Nature* the death of Dr. H. von Wild at Zürich, September 5, in his sixty-ninth year. He was director of the Central Meteorological Station at Bern, Switzerland, from 1863 to 1865; director of the Russian Meteorological Service from 1868 to 1895, and president of the International Meteorological Committee from 1882 to 1892. He was the author of numerous works on meteorology and terrestrial magnetism, and was the editor of the Russian *Repertorium der Meteorologie*. His greatest work was Temperatur-Verhältnisse des russischen Reiches, a volume of 349 pages and 271 plates.

Dr. Frank Pierrepont Graves, formerly president of the University of Wyoming, has resigned the presidency of the University of Washington.

MISCELLANEOUS.—A preliminary announcement of the Dunn County (Wisconsin) School of Agriculture and Domestic Economy has been received. This school opened at Menomonie October 20. A commodious brick building has been provided for the school, with equipment for cooking, sewing, and general instruction along all lines of the course, and a tract of land near by will be used for practical demonstrations. The course of study for boys includes work in the quality and composition of soils, plant life, vegetable gardening, crops, animal husbandry, dairying, poultry, economic insects, farm accounts, blacksmithing and other metal work, carpentry, and rural building. The course of study for girls includes work in sewing, cooking, home economy and management, drawing and designing, domestic hygiene, chemistry of foods, dairying, poultry, farm accounts, vegetable and flower gardening, and other plant studies. Both courses include reviews in common branches and studies in physical geography, civil government, physiology, library readings, English, and elementary science. Only two years will be required to complete the full course for either boys or girls, and shorter courses may be pursued. The principal of the new school, who is also agriculturist, is Dr. K. C. Davis, formerly horticulturist of the West Virginia Station.

A recent number of the *Journal of Horticulture* (54 (1902), No. 2782, p. 77) gives a brief account of the establishment of the Middlesex County Council School of Horticulture, a school of practical and scientific horticulture at Pymmes Park, Edmonton. The main object of the school is to give a thorough horticultural training to those who are anxious to take up gardening as a profession. Scientific training will go hand in hand with practical lectures and demonstrations. The garden work is to be under the direction of John Weathers, author of the recent work entitled A Practical Guide to Garden Plants (E. S. R., 13, p. 52).

An agricultural botanical institute was opened at Munich October 1, 1902. Its object is the promotion of agronomy especially and the conduct of experiments in the culture and manuring of plants and in plant breeding; studies of the bacteriology of soils, manures, etc.; the suppression of plant diseases; seed examination, and the botanical, microscopic, and bacteriological examination of feeding stuffs. Dr. Lorenz Hiltner, formerly in charge of the bacteriological section in the Imperial Health Office at Berlin, has been made director of the institute. He will have three assistants, and an experimental field will be placed at his disposal. The institute is a State institution, and will receive an annual appropriation of 24,500 marks (about $6,000).

The reorganization of the Halle Experiment Station, necessitated by the death of Dr. Maercker, has been completed. According to a note in *Die landwirtschaftlichen Versuchs-Stationen*, the original station has been divided into three parts—the agricultural-chemical experiment station, the control station, and the botanical station. The first, which is under the directorship of Prof. W. Schneidewind, has been subdivided into three divisions—the agricultural-chemical division, with the director in charge, and Dr. H. C. Müller vice-director; the botanical division, in charge of Dr. W. Kruger; and the experimental farm at Lauchstädt, in charge of Mr. Grebler. The control station is in charge of Dr. Brühring, director, with Dr. Naumann vice-director. Dr. Steffeck is director of the botanical station.

At the recent annual congress of the Royal Institute of Public Health, held at Exeter, England, Eaton Jones presented a paper before the Veterinary Section, on the Veterinary Supervision of Domesticated Animals, in which he called attention to the deplorable condition of town and county stables, cow sheds, and piggeries. Resolutions were adopted advocating the abolition of private slaughterhouses, the appointment of veterinary inspectors of all animals intended for food, the inspection of dairies and cow stables, and the making of suitable provision for the disposal of carcasses unfit for food.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, PH. D., *Assistant Director.*

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With the cooperation of the scientific divisions of the Department.

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EXPERIMENT STATION RECORD.

Vol. XIV. November, 1902. No. 3.

The second International Conference on Plant Breeding and Hybridization, which was recently held in New York City, exceeded in attendance and interest the previous meeting, held in London in 1899, and served to show the large interest in the subject in this country. An extensive programme of papers was presented, but only a portion of them were read. These discussed the principles of plant breeding and their application, as well as giving the results of years of work and observation in the production and propagation of improved varieties of plants.

In the theoretical discussion of the papers there was an almost universal acceptance of Mendel's law regarding the appearance of dominant and recessive characters in the later generation of hybrids. This law, although announced in 1865, has only recently been given wide publicity through its publication in various journals (E. S. R., 13, p. 744). It was the consensus of opinion that it is the best available working hypothesis for the plant and animal breeder, and that it seems to stand the test of experience to a remarkable degree. The methods of Mendel were commented upon, and in a number of papers his conclusions were reaffirmed relative to the necessity of large numbers of individuals in breeding experiments and the continuation of the investigations through many generations, in order that the results may be of permanent value. The futility of indiscriminate crossings and the necessity of working with pure strains or races was shown by abundant examples. A hybrid produced from a mixed ancestry is very liable to be inferior to either or both of its parents, unless by a long system of cultivation the characteristics of the parents have become definitely fixed.

In all kinds of breeding experiments it is necessary to adopt an ideal and adhere closely to it, rejecting for the time all secondary variations that may appear. If these seem very promising, they can be cultivated independently of the main investigation, but nothing should divert the breeder from continuing to follow to its conclusion the line of experimentation, which should be well formulated at the start.

Once a hybrid is established, then selection and cultivation enter into the problem of fixing it. The selection requires keen discriminating powers, and is in many ways more important than the act which produced the hybrid.

Another thought brought out quite prominently was the necessity for breeding to meet definite requirements. Changed seasonal, soil, and climatic conditions will often render worthless what are otherwise promising varieties. It is believed to be impossible to originate a variety of plant that is of universal value, and the transfer of valuable sorts to regions of markedly different character was said to be usually followed by disappointing results.

A high compliment was paid to the plant-breeding work that has been carried on in this country. One of the foreign guests declared that greater advance is being made along this line in the United States than in any other country, the great range of soil, climate, and necessities making such work possible.

The value of such a meeting in arousing an interest in the subject of plant breeding can hardly be estimated. The description of methods, criticism of results, and the application of principles were given and taken in a spirit of scientific earnestness, and the enthusiasm aroused will be continued and exhibited in the wide extension of the work.

The systematic work which is being done in plant breeding, including the study of principles governing it, is worthy of imitation in animal breeding. The field is quite as attractive, as far as possibilities of useful results are concerned. The breeding or selection of plants resistant to disease suggests that something might be done with animals in producing strains more vigorous or resistant to some of our troublesome diseases. In this connection some recent experiments reported from Algeria in attempts to combat Texas fever are interesting.[a] In the search for some animal of the bovine kind which was immune to Texas fever, it was found that both the buffalo and zebu were naturally resistant to this disease. The buffalo could not be crossed with the domestic cattle, and appeared to be for other reasons less desirable than the zebu as a substitute for cattle. It was found that the zebu crossed readily with different races of cattle, and that all hybrids thus obtained were perfectly immune to Texas fever. The female hybrids between the zebu and domestic cattle were found to be very fertile, while the males were well adapted to the production of beef or to performing work of various kinds. The hybrids attained a weight of about 360 kg. (792 lbs.) at an age of 3 years and the dressed weight averaged about 62 per cent of the live weight. The large hump composed of muscle and fat tissue and situated over the shoulders of the zebu largely disappears in the hybrid. The bones are unusually small and of a delicate nature. The meat is said to be of good quality. The milk of the zebu or of the hybrid is claimed to be richer than that of the ordinary Arabian cow. The zebu gives from 6 to 8 quarts per day, while hybrids yield from 15 to 16 quarts. Three different races of zebus have been introduced into Algeria, one from Madagascar, one from Cochin China, and a third from India. The third, or Brahmin race, is the only one which proved to be of economic importance and is the one from which the present zebus and hybrids of Algeria have descended.

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[a] Jour. Agr. Prat., n. ser., 4 (1902), No. 29, pp. 75–80.

These results with the zebu are borne out by the experience in Jamaica. Texas fever is very prevalent in that country, but it has long been known that cattle which contain a strain of zebu blood are immune to the disease. This zebu blood was introduced years ago for another purpose. It is now proposed to import a number of zebu bulls from India for the specific purpose of securing immunity to the fever. These are to be used in connection with the improvement of the common cattle in Jamaica, which are said to be degenerating to some extent.

INTERNATIONAL CONFERENCE ON PLANT BREEDING AND HYBRIDIZATION.

WALTER H. EVANS, Ph. D.
Office of Experiment Stations.

An international conference on plant breeding and hybridization was held in New York City, September 30 to October 2, 1902, under the auspices of the Horticultural Society of New York, with James Wood as president and Leonard Barron secretary. About 80 delegates were present, representing different parts of the United States, Canada, England, West Indies, etc. A programme of more than 50 papers was presented, a number being sent from Germany, Austria, France, Holland, and England. All of the papers are to be published in full in the proceedings of the New York Horticultural Society, which it is hoped will appear early in the coming year. A brief account is here given of a number of papers which were presented at the conference.

Prof. W. Bateson, of Cambridge University, England, considered the Practical Aspects of the New Discoveries in Heredity. He briefly reviewed Mendel's law of heredity, and pointed out some of the great advances which have been made since the enunciation of that law. In general it was stated that while great differences may exist in plants and animals, hybrids in their first generation represent the characters of one parent and not of both. The author believed that the time would soon come when the fundamental principles of plant and animal breeding would be known, so that the breeder would be able to control his work instead of depending upon chance results. For the practical man it is impossible to always determine the characters which exist in the parent plants. As an example, it is cited that green peas may be due to the union of 2 green varieties, of yellow and green varieties, or of 2 yellows, all of which tends to complicate the special hereditary characteristics. The frequent occurrence of bearded wheats in plats of beardless varieties was mentioned, and their presence was attributed to the probable fact that the beardless variety had been developed from a bearded form, the plants still containing some of the germ cells of the bearded ancestors. The predominance of the recessive germs resulted in the appearance of bearded forms, and the presence and influence of recessive germs can be eliminated only gradually. Species, according to the author, are not to be considered necessarily fixed or of long duration. Crosses or, as the author called them, heterozygote forms do not usually reproduce their kinds, but often result in reversion to ancestral types. A number of examples were cited of reversions which have taken place in the sweet pea, giant lavender primulas, Andalusian fowls, etc., which show that in a number of instances the forms are not readily fixed, being the result of complex crosses that are for the most part infertile.

A paper by C. C. Hurst, entitled Notes on Mendel's Methods of Plant Breeding, was read by the secretary. Mendel was apparently the first to recognize the necessity of considering each single character on its own merits. In selecting constant characters, he avoided confusion by crossing only constant and fixed races of plants, each of which had been the product of repeated self-fertilization. If plants are chosen for crossing, the ancestry of which is unknown, the resulting offspring will either be incomparable or incomprehensible. The writer cited his experiments with orchids in which by choosing constant characters he had almost entirely succeeded in eliminating the possibility of reversion. It is stated that some of the apparent exceptions to Mendel's results are probably to be attributed to the crossing of species which were not constant in character. The consideration of differential characters was briefly discussed, and it was stated that Mendel in his experiments always chose his characters in pairs, so that they would be distinctly differential and capable of definite recognition in the offspring. The more clearly defined the differences between the parental characters, the more marked will be the single characters in the resulting offspring. The fourth point in Mendel's method is said to be distinctly new, and that is the crossing together only of dominant and recessive characters. If one of the characters of the differential pair is always distinctly dominant over the other, the latter is known as the recessive character. Knowledge of this fact serves to give uniformity to the first generation and avoids the difficulty of continuing through subsequent generations breeding in which the results secured will not be uniform. The necessity of using large numbers of individuals was pointed out. In this there was great advance over Mendel's predecessors. After having secured hybrids they should be carried through many generations. Mendel in all cases carried his experiments to the third and fourth, and in some cases to the fifth and sixth generations. Summing up the methods of Mendel, the author states that hybridists who desire to follow the footsteps of Mendel and help elucidate the problems of inheritance will find it essential in their work to select parents possessing characters which are at once single and constant, differential and dominant, and they must also take care to raise large numbers of individuals through many generations.

A paper by Hugo de Vries, director of the Botanical Gardens, Amsterdam, Holland, discussed Artificial Atavism. Atavism was defined as the occasional restoration of an old type in a compound cross.

Crossing is said to not only combine characters, but to separate them. Among flowers as ordinarily listed in catalogues, there is usually the ordinary wild color as well as a white form, with various intermediates. If a cross be made between the white form and some of the intermediates, the resultant hybrids will fall into types, some of which return to the original color. The color variations and reversions produced by various crossings were shown by illustrations of well-known varieties. It is said to be possible to split up and produce new colors by crossing the original or wild color with any of the white forms. The results obtained usually follow the principles laid down in Mendel's law. A number of instances were cited in which it is shown possible to produce atavism artificially.

In commenting upon this paper, Professor Bateson stated that he believed synthesis in plant breeding, although sometimes apparent, is not truly possible. A compound character consisting of 3 or more components, he believes, can not be recomposed from its original forms.

Some Suggestions for Plant Breeding were made in a paper by Max Leichtlin, of Baden-Baden, Austria, which was read. In crossing plants the author states that the selection of a suitable time for crossing is of first importance. A warm, cloudy day offers the best conditions for about 60 per cent of plants. For some a dry atmosphere is best as it more nearly represents the conditions of their original habitat. Fertilization should not be attempted before the stigmas are in proper condition. This can be easily recognized after some practice. The pollen should be neither too fresh nor overripe. After applying the pollen to the stigma in many cases it will be found advantageous to cover the flower with a hand glass or some similar means for a day or two to give a higher temperature than that of the surrounding air. The pollen of many plants, if in good condition, can be kept in small glass vessels, well corked, for several days without losing its fecundating power. Whether fertilization is possible or not can be easily ascertained by a microscopical examination of the forms of pollen grains. If their forms are fairly constant the pollen will do for fertilization, but if markedly different its use for this purpose is impossible. The prepotency of sex was shown by the statement that in 8 cases out of 10 the female parent has the greatest influence on the progeny. The staminate parent usually controls the color of the offspring, and in most cases the hybrid plants have larger flowers than those possessed by either parent.

In the discussion following this paper a number of interesting facts were brought out relative to the vitality of pollen. The president of the society stated that the pollen of tomatoes would retain its vitality for fully 6 months, as shown by the common practice of gathering pollen during the late summer and fall months from plants grown out of doors, for use in fertilizing tomatoes grown under glass during the winter. According to another statement, grape pollen retains its vitality for fully 2 months, and the date palm for a year or more. Carnation pollen may be kept in closely stoppered vials for several weeks, and may be shipped from one part of the country to another. In preparing pollen for keeping, it should be thoroughly dried and placed in closely stoppered bottles. For plants grown in moist climates the drying should be done in the shade; for those growing in arid regions, it may be more quickly dried in the sun. It was stated that pollen of certain plants is commonly distributed through the West Indies on dry blotting paper inclosed in pasteboard boxes. In this way its vitality is retained for more than 3 weeks.

A paper giving Some Suggestions for the Classification of Hybrids, prepared by I. T. Lynch, curator of the Botanic Garden, Cambridge, England, showed the desirability of the classification of all results, so that reference can be had to previous work. A plan previously published by the author in the Journal of the Royal Horticultural Society of London, vol. 25, was briefly outlined. Investigators often want to know what plants have been found to respond in a certain way, or they may desire to reobserve from a new point of view, or carry further results in which they may be interested. This was cited to show the importance of classifying all experimental results, and action of the conference along this line was recommended. The writer requested that he be furnished with accounts of hybrids which at first were nearly barren and afterwards became fertile; also of hybrids which are less fertile than either of their parents. He also asked that suggestions be sent him regarding different systems of classification. In general, he proposes the classification of hybrids based upon their behavior, rather than upon the classification of natural orders, genera, or species.

The Principles of Plant Breeding were discussed in a paper by Luther Burbank, of Santa Rosa, California. The two influences or forces which control plant and animal breeding are heredity and environment. To guide the interaction of these two forces is the sole object of the breeder, whether of plants or of animals. A general knowledge of the relations and affinities of plants is not sufficient for the successful plant breeder. He must be a skillful biologist, and, having a definite plan, must be able to correctly estimate the action of the inherent and external forces which he would control. A plant breeder before attempting to make new combinations should select with great care the individual plants which seem best adapted to his purpose. This requires an exceedingly keen perception of minute differences, great patience, and extreme care in treating the organisms operated upon. This applies more particularly to annuals or those plants generally produced by seed. In breeding perennials the first deviations from the original form are often of an almost unappreciable degree. By careful and intelligent breeding, any peculiarity may be made permanent, and there appears to be no limit to the improvement of plants. Cultivation and care may help plants temporarily, but by breeding plants may be produced which will do better work in all places and for all time.

W. A. Orton, of this Department, read a paper on the Breeding of Disease-Resistant Varieties, in which a résumé was given of work being carried on by the Bureau of Plant Industry. The wilt disease of cotton, cowpeas, and watermelon was described and photographs and material shown. As a result of continued selection of resistant varieties, it was stated, Sea Island cotton is now grown in regions which had been practically abandoned on account of the destruction caused by the wilt. No varieties are wholly resistant, but a number of strains have been found which are to a great degree able to resist the fungus. In general, upland cotton seems less resistant to wilt than Sea Island, and Egyptian varieties are more resistant than any of the others. The work so far has been one of selection, since hybridization is not practicable, as it tends to destroy the merchantable character of the fiber. Similar results in the selection of cowpeas and watermelons were cited, and the author believes that many other varieties of plants may yet be found that are resistant to disease.

W. M. Hays, of the Minnesota Station, presented a paper on Breeding for Intrinsic Qualities. He believed the value of plants and animals annually produced in this country could be readily increased 10 per cent at an expense of less than 1 per cent. The greatest financial gains would probably be secured by the improvement of a score of plants and about 4 species of animals. By carefully growing and testing many thousands of individuals there will frequently be found some one individual of such superior merit as to repay all expense. In any hybridization work a good foundation stock must first be produced upon which to base the new varieties. The importance of working with large numbers of individuals and the value of correlated qualities were pointed out. During the progress of the work various side lines may enter, but these must be held subordinate to the main idea which controls the experiment. In choosing varieties, often very perplexing problems arise. As a rule crosses should be made between individuals which closely approximate the ideal, and not between those which are too dissimilar. An illustration of the value of using large numbers was given in the experiments in breeding wheats. To begin with, 500 plants were examined for foundation stock and tested from 3 to 5 years to see that they came true to seed. After continuing the work this length of time, all were rejected but about 50, which were given a field trial. This work has been continued, large numbers of individuals being constantly grown, and as a result 2 or 3 varieties have been found which are intrinsically of great value. In wheat breeding the author thinks that an increased yield, irrespective of distinguishing marks, should be the ideal sought.

A paper on the Correlation between Different Parts of the Plant in Form, Color, and Other Characteristics was read by S. A. Beach, of the New York State Station. By means of a number of specimens he showed the correlation which exists between different parts of plants. By the proper study of the correlation of form, color, vigor, etc., undesirable material may be eliminated to a great degree while the seedlings are still young. In this way much valuable time and space may be saved. Numerous examples were cited in which this early elimination is possible. Small foliage is said to be usually correlated with small fruit. The texture of the leaf and of the fruit are believed to be correlated to some degree. Dwarfed seedlings produce poor plants even when given good cultivation. Attention was called to the importance of considering groups of characteristics. In the case of the peach there seems to be a direct relation between the size of the foliage and the size of the fruit, and sufficient evidence is believed to be at hand to show that size and color of foliage and flowers may be depended upon in predicting the character of fruit. Pale or light colored blossoms are usually associated with small fruit in apples, while deep color is correlated with larger fruit. Pale foliage in the raspberry is correlated with yellow or light colored fruit, and dark fruit is obtained from plants having dark foliage and canes. Roses, cannas, and asters generally follow the same lines—pale colored foliage indicating light colored flowers. In comparing these factors, fully matured leaves should always be examined and even then exceptions will be noted. A correlation is said to exist between the color of the flowers and the seeds of beans, between the color of the roots and stems and the flowers of carnations, between the color of the seed coats and character of plants of peas, etc. There is apparently some correlation between the size of the different organs of plants and possibly between their size and color, but as yet the evidence is not sufficient to formulate definitely.

O. F. Cook, of this Department, discussed Evolution under Domestication, claiming that it is not rational to attribute to environment all of the changes found in plants and animals.

The Varying Tendency and Individual Prepotency in Garden Vegetables was the subject of a paper by W. W. Tracy, of Detroit, Michigan. The author's long experience has enabled him to examine an immense number of specimens of different vegetables and note some of their peculiarities. These variations will frequently be apparent only from a careful study of a great number of plants. It is stated that different plants of the same natural order tend to vary along parallel lines, and variations that are frequently attributed to hybridization are due to ordinary variation. Different natural orders of plants are differently affected by soil, climate, etc. In some cases plants grown from seed from widely different regions did not show any appreciable difference; in others, marked differences may be noted in comparatively slight changes. An example was cited in which a variety of watermelon was grown in Michigan and in a Gulf State, the seed being from the same source, and the progeny was so similar as to defy any detectable differences. The effect of cultural and climatic influences is cumulative. This was illustrated by the simultaneous occurrence in widely separated regions of bush forms of Lima beans, sweet peas, etc. These plants ordinarily grow in climbing forms, but bush forms suddenly appeared in different parts of the United States, seeming to indicate that the influences had been simultaneously working in different regions. Stock produced by an individual grower will vary widely during different seasons. Seed from the same stock, equally well grown under precisely the same conditions, show marked differences in the tendency to adhere to type in different seasons. Seeds from individual pedigreed stock plants vary widely in their progeny, and the only way to secure uniformity is to define an ideal, select carefully, and propagate carefully, so as to secure a lineal descent of a single typical plant.

Dr. D. Morris, Imperial commissioner of agriculture for the West Indies, read a paper on the Cross Fertilization of the Sugar Cane, in which he described the experiments in the West Indies in the improvement of sugar cane. The subjects for consideration are a greater tonnage of cane, a greater yield of juice, a higher sugar content, and a cane immune to diseases. More than 60 varieties of canes have been imported from all parts of the world and tested at the various West Indian stations. Special attention has been paid to bud variation, and a few examples have been found, which were briefly described. Some of these are quite promising as improvements over the older varieties, and so far they tend to come true to color. Nearly all of the bud variations or sports which have been under investigation originated from the ribbon or striped cane. Planting from different parts of cane has not given results of any great value or improvement, and selection by analysis of the cane juice does not appear to offer promise of definite results, nor has selection proved of value when the richest canes have been taken individually. Where the richest clump in a field was tested there was some indication of value, and this is believed to warrant further investigation. A description was given of attempts to produce new varieties from seed. The fact that the sugar cane sometimes produced fertile seed was established about 1887. At that time fungus diseases had almost entirely destroyed many of the best varieties in Java and in the West Indies. A careful examination of the flowers, which are very small and very numerous, showed that occasionally a few seed in a panicle were produced, frequently only 2 or 3 being found in a panicle containing many thousand flowers. In the author's experiments the whole panicle was sown in boxes in the hope of the presence of some fertile seed. On account of the minuteness of the flowers and the rarity of the production of fertile seed, the ordinary method of cross fertilization could not be adopted. Staminate plants were planted to the windward of the pistillate ones, or in alternate rows. In another series the panicles were covered with bags and later dusted with pollen-bearing plants of known value. It was found that frequently the pollen was infertile, while the pistillate flowers were fertile. The most valuable varieties so far obtained through seed canes have followed the principal characteristics of the staminate parent.

So far as the writer's observation has gone, the seed canes tiller more extensively than the plants from the cane top. The Ribbon and White Transparent varieties have proved the best for mother plants, the mother plants governing the size, color, and to a considerable extent the sugar content of the cane. Purity of the juice has not been definitely determined as due to either parent. As to the yield of sugar, the average for the island of Barbados is said to be 1.7 tons per acre, while one variety shown by the writer, designated as No. 208, yields 3 tons of sugar per acre at Barbados, and its value has been further attested on the islands of Trinidad, St. Kitts, etc.

A paper on the Cytological Aspects of Hybrids, by W. A. Cannon, of Columbia University, New York, showed that the relation between the cytological and experimental studies could not be definitely stated in the present state of our knowledge on the subjects. A review was given of Mendel's laws in the light of modern cytological studies. So far these studies have been made on first-generation hybrids. It is said that the normal division of sex nuclei leads to fertility in hybrids, but abnormal division to sterility. Cytological studies on cotton and other hybrids, it is claimed, show (1) a possible cause of sterility, (2) that variation in the hybrid may or may not be associated with variation in spermatogenesis, and (3) that chromosomes tend to retain their respective individualities, as shown in many hybrids examined.

Improvement of Roses by Bud Selection was the subject of a paper by L. C. Corbett, of this Department, in which experiments were reported which were undertaken to determine the relative value of blind and flowering wood in rose production. It was shown that individual characteristics of a branch were perpetuated from generation to generation in plants asexually propagated, and also that cumulative results are not to be expected by the selection of parts showing like tendencies through successive generations. The flowering habit of plants produced from flowering wood through five generations was in no way increased, nor was it diminished when blind wood was employed in a like manner. From the commercial side this has an important bearing, as it is more economical for the florist to produce his roses each season from blind wood.

Under the title of Improvement of Oats by Breeding, J. B. Norton, of this Department, gave a description of the work recently undertaken in the plant-breeding laboratory. This has included the selection and hybridization of oats to secure rust resistance, hardiness, increased yield, to prevent lodging, etc. As yet the results can not be definitely determined.

In experiments to increase the yield and hardiness of winter oats by selection, sowings were made at different dates late into the autumn, and the hardiness of the plants was tested by freezing out during the winter. It was found that the farther south seed oats are produced, the earlier the crop when sown at Washington; and there are apparently no varieties of oats which come absolutely true to type description. In experiments in crossing, only 5 to 10 per cent of successful fertilizations were ordinarily secured. If cool, moist days were chosen for pollination, better results would be obtained, in some cases almost 100 per cent of the pollinations resulting in the production of fertile seed. The presence of natural crosses was briefly commented upon, and it was stated that Rimpau in his work, covering many years, observed only 4 or 5 cases. This seems to indicate that oats are nearly always self-fertilized.

In commenting upon this paper, Director Saunders, of the Canada Experimental Farms, called attention to the Canadian work along the line of oats breeding, which has been carried on for about 10 or 12 years, and D. G. Fairchild referred to the work being conducted at the experiment station at Svalöf, Sweden, along similar lines. (E. S. R., 13, p. 814.)

The subject of Breeding Florists' Flowers was treated in papers by E. G. Hill, of Richmond, Indiana, C. W. Ward, of Queens, Long Island, and A. Wintzer, of West Grove, Pennsylvania. In Mr. Hill's paper notes were given on breeding experiments with roses, carnations, and geraniums. Of many thousand hybrids produced, but few of desirable quality were obtained. Not one in a thousand was said to in any way approximate to the value of the ideal which was sought. When the great number of hybridizers who are experimenting with roses is considered, the number of valuable new sorts is very meager compared to the amount of labor expended. While rose fertilization is said to be very easy, the most important part of the work is in properly maturing the seed and propagating it. A number of successful hybrid roses were cited as being recently introduced into the market. Somewhat similar results were reported with carnations, in which out of thousands of seedlings grown every year by hundreds of growers, only a few improved forms are annually obtained. In experiments with chrysanthemums the best results have been obtained, it was said, when only double forms were used for parent stocks. The hybridizing of begonias was also commented upon, and the origin of a number of the finest new varieties was indicated. Attention was called to the fact that La France, claimed to be the parent of many new varieties, is absolutely sterile in some countries.

The results of experiments in crossing pumpkins were described by L. H. Bailey, of Cornell University, in a paper entitled A Medley of Pumpkins. The author began a series of experiments in 1887, which was continued for 10 years, to determine the immediate effect of pollen on fruit. After a number of years' investigation, no immediate effect of pollen could be recognized on cucurbit fruits. The experiments were continued, however, to see what would be the result of crossing 2 varieties of squash. These varieties were hand pollinated, the seed saved, and in the third generation the plants occupied between 8 and 10 acres. Of the product examined, fully 1,500 forms were noted which did not resemble either parent in form or shape. The plants seemed to be almost wholly self-sterile to their own pollen. The seed of one form, designated as Alpha, when planted, gave 110 distinct kinds of fruits and innumerable intermediates. The parent stock of this experiment was pedigreed and usually came true to type, but the progeny resulting from crossing was so variable as to give nearly as many types as there were individuals. New characters continually appeared in the second and third generations, and the confusion became so great that the experiment was abandoned. Another experiment was described, in which one of the small ornamental pear gourds was crossed with pollen from the typical Connecticut pumpkin. From the seed secured, 39 plants resulted and no two fruits were identical. Nineteen forms were found that were fairly well marked, and these were described as types. In all the experiments seedlessness seemed to be a common trait of crossed cucurbits, or if seed were produced they were ordinarily sterile. An attempt was made to reciprocally cross *Cucurbita pepo*, *C. maxima*, and *C. moschata*. Only 3 fruits were obtained, and those, species hybrids, were between *C. pepo* and *C. moschata*. The progeny grown from these seed were more uniform in character than those obtained by crosses in the varieties of *C. pepo*. Continuing this work through a number of generations, the *moschata* type entirely disappeared and the plants were to all appearances *C. pepo*.

Results of Hybridization and Plant Breeding in Canada was the title of a paper presented by William Saunders, director of the Canada Experimental Farms. He gave a brief résumé of 40 years' work in Canada along the line of production of new varieties of fruits, cereals, etc. His work with wheat, oats, barley, and various fruits was described, the methods of manipulation being given in considerable detail. Specimens were exhibited which showed the results of a number of the crosses. Among them were crosses of *Pyrus baccata* with several varieties of Russian apples, of different species of barberry, of gooseberry and black currant, of *Pyrus maulei* and *P. japonica*, and of various cereals.

During an evening session a number of papers were presented which were illustrated by specially prepared lantern slides. The first of these was by W. B. Alwood, of the Virginia Station, in which an account was given of investigations in wine fermentation. The selection, propagation, and uses of pure cultures of yeasts in wine and cider making, and in brewing and distilling, were considered and the different methods of elimination and of cultivation described. Graphics were shown of the action of various wine ferments upon grape must.

The second illustrated paper was by W. Van Fleet, of Little Silver, New Jersey, on Hybridizing Gladiolus Species. In growing Gladioli, only summer-blooming varieties with good winter-keeping corms are desired in this country. Hybrids of large flowered species seldom prove valuable in the first generation but seem to improve in subsequent ones. Many species hybrids have been produced but few have proved of intrinsic value. As a rule, Gladioli do not grow well in clay. Sandy soil with an underlying of peat, if kept well wet, is the best soil for their growth. A number of hybrids were exhibited, one of which (Princeps) was said to have a flowering period of nearly 5 weeks, 4 or 5 of the huge flowers succeeding each other until the entire spike has blossomed. This same phenomenon occurs when flower stalks are cut and placed in water, if the water is frequently changed. During 16 years of active hybridizing, in which a number of species were used for breeding purposes and more than 150,000 seedlings produced, many new commercial varieties would have been expected, and although there were many promising novelties only 2, Princeps and Lord Fairfax, have been thought worthy of naming and commercial introduction.

The paper of C. W. Ward, of Queens, Long Island, on Breeding Florists' Flowers was also illustrated by lantern slides. He gave the results of 12 years' work in the hybridization of carnations. His work has been confined to 8 types of stock which were based on color differences. These have been subjected to various crossings, and it was said that the staminate parent showed its effect in the color of the progeny. If crossed upon another flower of the same color the resultant plant would show reversion to prominent ancestral types. The writer claims that when the commercial habit of the carnation has been established any desired color can be bred into it. In breeding carnations, if it is desired to heighten the color in no case should purple or similar colors be used, as those colors tend to dull the color of the progeny. The most difficult colors to fix in hybrid carnations are the yellows and blues, and the variegated forms are almost impossible to fix. Of 60,000 seedlings grown to flowering, 36 have been considered of sufficient merit to continue propagation, and of this number 16 have been introduced to commerce. In the lantern slides accompanying this paper were shown the parentage and progeny of many of the hybrids produced by the writer.

N. E. Hansen, of the South Dakota Station, read a paper on the Breeding of Native Northwestern Fruits. The prairie regions of the Northwest require the breeding of new varieties of fruits, since all the Eastern varieties so far tested have proved too tender. The writer has been extensively engaged in originating new varieties and more than 100,000 seedlings have been under investigation. To induce variation he proceeded on Darwin's theory that excess of food induces variation, and the writer believes that selection and cultivation are the chief factors to be considered in his region. His work with the sand cherry (*Prunus besseyi*) was described at considerable length. Of this promising fruit between 4,000 and 5,000 seedlings of the third generation are under investigation. The quality of the wild fruit is known to be very variable, and this has been taken advantage of in his propagation work. He has at present 75 varieties budded upon plum stock. The results obtained so far have yielded a larger and better flavored fruit. The sand cherry is said to cross readily with many species of Prunus, and valuable hybrids may possibly be secured. Experiments with raspberries, strawberries, currants, gooseberries, and huckleberries were briefly reported, and promising crosses have been obtained of all of them.

T. V. Munson, Denison, Texas, gave the results of his investigations and observations on the selection and hybridization of grapes in a paper entitled Advantages of Conjoint Selection and Hybridization and Limits of Usefulness in Hybridization among Grapes. The author claims that the quality of grapes may be readily improved by increasing the vigor of the vine. To secure better varieties of fruit recourse should be had to selection and hybridization. Selection alone is considered too slow, and new flavors and characteristics can be obtained only in a limited degree through bud variation. On the other hand, indiscriminate crossing without selection may prove injurious, and it is only when crossing is followed by careful and continued selection that valuable results are obtained. The methods of securing crosses were described and the statement made that any method of crossing which is adapted to a genus of plants having many species will be found adapted to other genera possessing numerous species. Among the limits of crossing the author considered the possibility of double fecundation, stating that were it possible it would aid very materially in hybridizing so that in a single generation forms possessing several desirable attributes could be obtained. In grape hybridizing, as well as with other plants, so far as possible pure races alone should be used. Seasonal changes, soils, and climates influence the character of hybrids. A hybrid adapted to a given region in which it has exceedingly valuable characteristics may utterly fail in other regions with different conditions. Special sorts of grapes and other plants should be produced for special conditions, and no attempt should be made to develop a variety that would be expected to contain all the desirable qualities and adapted to all regions and climates. A number of examples were cited of desirable parentage for new sorts for special qualities, conditions, and regions. The parentage of a large number of well-known varieties of cultivated grapes was traced at considerable length.

C. E. Saunders, of Ottawa, Canada, read a paper on the Variations in the Second Generation of Berberis Hybrids. In this paper the results of experiments in crossing *Berberis thunbergi* as a pistillate and *B. vulgaris purpurea* as a staminate parent, in which a large number of hybrids was obtained, are described. Some of the hybrids were intermediate in the size of the plant, and size, shape, and color of the leaves, while in others the different characters were widely divergent. As a result of his observations it was found that these hybrids tended to uniformity in the first generation and wide variation in the second and subsequent generations, as shown by more than a thousand seedlings. In the first generation little or no purple color was observed, but the color of the foliage came out well in many specimens of the second generation. The leaves, thorns habit of plant, etc., varied widely in the later generations.

Bud Variation in the Strawberry Plant was the subject of a paper by R. M. Kellogg, of Three Rivers, Michigan. This is said to be very common in the Strawberry Plant, and an account was given of 19 years' effort on the part of the writer to produce more vigorous types of strawberry plants by forcing growth through the use of fertilizers, by tillage, and continued selection. The effect of the different kinds of fertilizers in culture was shown, and an excess of nitrogen was used to stimulate vegetative growth and thus induce variation. The individual peculiarities of plants must be considered in producing new forms, and where valuable individual characteristics appear, as shown by bud variations, these should be eagerly sought and propagated.

G. T. Powell, director of the Briarcliff School, New York, gave the results of 10 years' experiments in propagating bud variations of the Sutton Beauty and Tompkins County King apple, his remarks being illustrated by specimens of fruits.

H. C. Price, of the Iowa Station, read a paper on Hand Pollination of Orchard Fruits. This is not difficult, but ordinarily the results obtained are very slow in development. The plan of cooperation maintained by the Iowa Experiment Station with orchardists throughout the State, in which pollen of known varieties is distributed, was described. The seedlings resulting from the hand polination of fruits are grown and carefully examined. In the cooperation it is, so far as possible, desired that the orchardist should produce his own seedlings rather than send them to the station. The effect of different kinds of emasculation of the flowers was described. Low emasculation, in which all the flower but the style was cut away, did not give as favorable results as high emasculation, in which only the corolla and anthers were removed. Studies on the time for operation showed that the immediate transfer of pollen after the emasculation of flowers gave the best results. Pollen applied to the stigmas by a camel's-hair brush gave slightly better results than where transferred by the fingers. Pollen taken from the anthers just before the opening of the flowers seems to be the most potent and gave the best results.

H. F. Roberts, of the Kansas Station, read a paper on Cereal Breeding in Kansas, in which he briefly reviewed some of the efforts that have been made in corn and wheat breeding. In breeding wheat for growth in Kansas, hardiness in winter, drought resistance, and increased production are the points sought. In a variety of wheat seeming to possess extreme hardiness a number of spikes appeared which showed a tendency toward the club-wheat form. These heads, to the number of 61, were collected and are to be studied during the coming season. Eleven of the heads were apparently of exceedingly great productivity. The grain will be planted and the results announced in due time. It is desired to secure a variety in which the spikelets and heads are more completely filled. Experiments in breeding macaroni wheats to secure greater drought resistance are also under way, and a number of other experiments were briefly mentioned.

William Fawcett, director of Public Gardens, Jamaica, gave a brief account of the plant-breeding work that is being conducted in Jamaica. Naturally the investigations have been conducted on tropical plants. The differences in the character of the different flower clusters of banana were pointed out. The lower or earlier ones are usually all female, and the ovary is twice the length of the rest of the style. Those next are both male and female, and the last ones to appear are all staminate. If the male flowers be cut from a bunch it results in early ripening and in uniformity of fruit. A number of attempts were made to artificially pollenize the banana, and some seeds were set but they failed to germinate. Experiments were reported in which the Smooth Cayenne and Ripley pineapples were crossed. The flowers of the pineapple are said to be almost wholly self-sterile. Many seedlings have been obtained, most of which were intermediate between the parents, but as yet they have not developed valuable characters. Experiments with mangoes have not yet proved successful. The investigations have shown that the Avocada, or alligator pear, may be budded with success.

The remaining papers of the programme, read by title, were as follows: Notes on New Hybrids, J. H. Wilson; Selection *v.* Hybridism, F. W. Burbidge; Some Laws of Plant Breeding, H. J. Webber; On Variation in Plants, J. B. Norton; Some Possibilities, C. L. Allen; Fertile Hybrids of Teosinte and Maize, J. W. Harshberger; A Study of Grape Pollen and What the Results Indicate, N. O. Booth; The Improvement of Corn by Breeding, C. P. Hartley; Improvement of Crops for Arid Regions and Alkali Soils, T. H. Kearney; Improvement of Cotton by Breeding, H. J. Webber; Practical Points from the Breeding of Strawberries and Bush Fruits, F. W. Card; Crossing Species of Salix, S. W. Fletcher; Notes on Breeding Hardy Apples, J. Craig; The Everbearing Strawberry, P. de Vilmorin; The Muskmelon, F. W. Rane; Results in the Breeding of Species of Ricinus, E. M. Wilcox; On Orchid Hybrids, O. Ames; Hybrid Beans, R. A. Emerson; Hybrid Plums, F. A. Waugh; Cross Breeding of Cinchonas, H. H. Rusby; Notes on Plant Breeding in California, E. J. Wickson; Plant Breeding in New Jersey, B. D. Halsted; The Wild Hybrids of the North American Flora, D. George; Plant-Breeding Work in Germany, J. C. Whitten; and Hybrids and Diseases, L. H. Pammel.

The afternoon session of October 2 was held at the New York Botanic Garden, Bronx Park, where the delegates to the conference were entertained as guests of the directors of the garden. On Friday an excursion was given the delegates up the Hudson to Poughkeepsie, in the vicinity of which a number of private estates were visited.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Manual of agricultural chemistry, H. INGLE (*London: Scott, Greenwood & Co., 1902, pp. 388, figs. 11*).—This volume "is based upon lectures delivered annually, for several years past, by the author, to classes of agricultural students, many of whom had already acquired some knowledge of general chemistry. . . . In all cases the writer has endeavored to avoid empiric statements, and to give, as far as possible, an explanation of the facts or phenomena described." The introductory chapter deals with the distribution and relative abundance of the elements. Other chapters discuss the composition of the atmosphere, the materials from which soils are formed, the agencies active in soil formation, the constituents of soils as related to their chemical and physical properties, and the classification of soils; the reactions occurring in soils (chemical, physical, and biological nitrification, denitrification, action of gases and water, and electrolytic dissociation); analysis of soils (physical and chemical); natural manures and commercial fertilizers; analysis and valuation of manures and fertilizers; the constituents of the plant and the chemistry of the development of its different parts, including explanations of the assimilation of carbon dioxid through the stomata of the leaves based upon the generally accepted kinetic theory of gases, and of the essential differences between osmoses and diffusion as related to plant growth; the proximate composition of the principal farm crops (with methods of analysis); the chemistry of the animal organism and of its functions; foods and feeding; milk and its products (including analysis); miscellaneous products used in agriculture, including arsenic, mercuric chlorid and various plant poisons, bleaching powder, copper salts, iron sulphate, disinfectants, fungicides, and insecticides; and an appendix of useful tables.

Rapid volumetric method for determining phosphoric acid in fertilizers, A. L. EMERY (*Jour. Amer. Chem. Soc., 24 (1902), No. 9, pp. 895–897*).—A modification of the volumetric method adopted by the Association of Official Agricultural Chemists is described. The most important change proposed consists in shaking the solution vigorously by hand after adding the ammonium molybdate.

The determination of phosphoric acid by titration of ammonium phosphomolybdate, J. CÉZAR (*Bul. Assoc. Belge Chim., 16 (1902), pp. 247–253; abs. in Chem. Centbl., 1902, II, No. 12, p. 820*).—The author reports tests of Nyssens' method (E. S. R., 13, p. 614) and describes slight modifications of certain details of it.

On the determination of total phosphoric acid in Thomas slag, C. ASCHMAN (*Chem. Ztg., 26 (1902), No. 71, p. 823*).—The author describes a modification of his method (E. S. R., 11, p. 507), which consists in proceeding with the determination immediately after obtaining the filtered solution of the slag, instead of allowing the solution to stand 12 hours.

On the influence of potassium ferrocyanid on the precipitation of phosphoric acid by ammonium nitromolybdate, A. F. LEUBA (*Ann. Chim. Analyt., 7 (1902), No. 7, p. 257*).—It is shown that potassium ferrocyanid interferes with the precipitation of phosphoric acid by ammonium molybdate, due to the fact that it yields a dense reddish-brown precipitate, to which the formula $Mo(OH)_4$ is assigned. This precipitate dissolves in sodium carbonate solution, and when this is exactly neutralized with nitric acid and heated the yellow phosphomolybdic compound separates out.

Double ammonium phosphates in analysis, Martha Austin (*Amer. Jour. Sci., 4. ser., 4 (1902), No. 80, pp. 156–160*).—The author briefly reviews her own work (E. S. R., 10, p. 419) and that of other investigators relating to the accuracy of the determination of magnesium, manganese, cadmium, and zinc by means of double ammonium phosphates, and calls attention to certain precautions which must be observed to insure accuracy, especially the use of anhydrous asbestos in filtering. The results obtained by Miller and Page[a] in the determination of cadmium are stated to be unreliable by reason of their use of hydrous (serpentine) asbestos. The modification of the author's method for the determination of zinc and manganese proposed by Dakin[b] is criticized as inaccurate on account of the error introduced by washing with ammonium phosphate and alcohol and by the use of hydrous asbestos in filtering.

Rediscovery of a process for rendering phosphoric acid available, C. Baskerville (*Science, n. ser., 16 (1902), No. 397, p. 215*).—An abstract of a paper read before the North Carolina Section of the American Chemical Society at Raleigh May 17, 1902, in which the author's experiments in fusing insoluble phosphates with alkaline sulphates, sulphids, nitrates, and carbonates are briefly referred to.

The detection of nitric acid in presence of an alkaline ferrocyanid or ferricyanid, A. F. Leuba (*Ann. Chim. Analyt., 7 (1902), No. 7, p. 258*).—The test for nitric acid by adding sulphuric acid and a ferrous salt can not be made in the usual manner in the presence of alkaline ferrocyanids or ferricyanids, since these form dark blue compounds. When, however, a slight excess of concentrated solution of cadmium chlorid is added and the insoluble cadmium ferrocyanids and ferricyanids removed by filtration the test may be made as usual.

The determination of organic nitrogen in water, H. Causse (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 25, pp. 1520–1522; abs. in Chem. Centbl., 1902, II, No. 6, p. 475*).—In the method proposed the organic compounds of nitrogen are precipitated by means of a saturated solution of baryta water containing 20 per cent of barium chlorid, the organic matter destroyed by digestion in sulphuric acid, and the nitrogen determined by nesslerizing the ammonia obtained by distilling the solution obtained, after addition of an excess of potash.

New apparatus in water analysis, A. G. Woodman (*Jour. Amer. Chem. Soc., 24 (1902), No. 9, pp. 897, 898*).—A criticism of the apparatus of Thomas and Hall for collecting samples of water for the determination of dissolved oxygen or carbon dioxid (E. S. R., 14, p. 10). The author explains why, in his opinion, the samples collected in the way proposed do not represent the exact character of the water being tested.

Gluten feeds, determination of fat and acidity, E. Gudeman (*Science, n. ser., 16 (1902), No. 399, p. 287*).—The author states that drying corn gluten feeds in hydrogen, vacuum, or air modifies them sufficiently to give low results for the percentage of fat and increases the acidity of the extracted fat. Gluten meals containing 5.16 per cent of fat before drying gave 3.56 after drying. The acidity of the fat extracted before drying was from 5 to 15 per cent and after drying from 20 to 40 per cent. The acidity as determined varies materially, according to the indicators used. The author claims that acidity of feeding stuffs is due to the presence of acid salts, and is no criterion of the quality of the feed or raw materials from which it was made.

Glucose determination, E. Gudeman (*Science, n. ser., 16 (1902), No. 399, p. 288*).—The author states that the polariscope gives incorrect results, due to the varia tion in the rotating power of glucoses between 80 and 198. He suggests determination by means of Fehling's solution after inversion at 67° C. and after treatment with malt. Invert sugar is determined by double polarization at 20 and 87° C. From these results the amount of reducing and nonreducing substances is directly calculated and the sum of the two taken as the actual amount of commercial glucose or grape sugar present in the mixtures.

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[a] School of Mines Quarterly, 22, p. 391.

[b] Chem. News, 82, p. 101; 83, p. 37.

The polarization of fruits, jellies, jams, and honeys, L. M. Tolman (*Jour. Amer. Chem. Soc., 24* (*1902*), *No. 6, pp. 515–524, figs. 2*).—The author investigated the action of hydrochloric acid upon the rotary power of invert sugar. Cane sugar was inverted with citric acid and hydrochloric acid added in different proportions to equal quantities of the solution. The change in rotation to the left due to the addition of hydrochloric acid was the same whether polarization was made immediately in the cold or after the solution had been heated to 67° C. and was proportional to the quantity of acid used. A correction for the hydrochloric acid is therefore necessary in the calculation of cane sugar in invert sugar by Clerget's method. The following formula in which S=sucrose, a direct reading, b invert reading, and t temperature, while not applicable to fruit products containing glucose, is given by the author as of special value in estimating small amounts of cane sugar in fruits, pure fruit jellies, jams, and honeys in which large amounts of invert sugar are present.

$$S = \frac{a - (b - 0.062\, b)}{141.79 - \frac{t}{2}}$$

The effect of the acid is represented by 0.062 b. Readings should be made at about 20° C.

On the quantitative separation of maltose and lactose, C. I. Boyden (*Jour. Amer. Chem. Soc., 24* (*1902*), *No. 10, pp. 993–995*).—The method given is based upon the removal of maltose by *Saccharomyces anomolus*, which apparently does not affect the lactose.

Refractive indices of salad oils—correction for temperature, L. M. Tolman and L. S. Munson (*Jour. Amer. Chem. Soc., 24* (*1902*), *No. 8, pp. 754–758*).—The correction for temperature for the refractive indices of linseed, cotton-seed, peanut, corn, sesame, olive, and rape oils as determined was about 0.000365 for 1° C. and was practically uniform for the different oils.

The influence of growth of mold upon the chemical composition of oleomargarine and butter, C. A. Crampton (*Science, n. ser., 16* (*1902*), *No. 399, p. 288*).—Analyses are given of a series of samples of oleomargarine which had been kept for 3 years and become infected with a growth of mold. These results show great variation in the composition of the fat, believed to be induced chiefly by the mold. The author believes they indicate that the rancidity of fats is brought about (primarily, at least) by the influence of the growth of micro-organisms or the enzyms produced by them.

Tables for use in the determination of fat in cream by the Gerber method, A. Hesse (*Molk. Ztg., 16* (*1902*), *No. 23, pp. 406, 407*).

BOTANY.

Fieldbook of American wild flowers, F. S. Mathews (*New York: G. P. Putnam's Sons, 1902, pp. XX+552, col. pls. 24, figs. 268*).—This book gives a short description of the character and habits of many of our best known wild flowers, together with a concise definition of their colors, and incidentally refers to the insect visitors which assist in their fertilization. The arrangement of the orders and genera is that adopted by Engler and Prantl, and a conservative treatment of specific nomenclature is followed. Species representative of 72 families of plants are described in language as nontechnical as the subject will admit; and as a fieldbook the compactness of the volume, conciseness of the descriptions, and excellence of the illustrations make it easy to identify many of the more common species of wild flowers. The absence of any key to orders and genera may prove detrimental in the estimation of some, but through the popular instruction in nature studies many plants are known by their family affinities, and this work will be found valuable in supplementing the other studies.

The cultivated guavas and their botanical differences, J. B. Davy (*California Sta. Rpt. 1899–1901, pt. 1, pp. 86–88*).—In view of the increasing interest which has been shown in the cultivation of guavas, the author has prepared a brief account of the botany and economic uses of the genus, together with a key of the species already introduced, by which they may be readily distinguished. Five species are described in considerable detail, the classification given being based on differences of the branchlets. A number of other species are mentioned which are insufficiently known, and notes given on others which might probably prove serviceable in plant-breeding experiments.

Some Australian vegetable fibers, J. H. Maiden (*Agr. Gaz. New South Wales, 13 (1902), No. 2, pp. 167–182*).—A list is given of some of the more important Australian fiber plants, together with notes on their distribution and economic value. The different plants are grouped according to orders.

The Geastræ, C. G. Lloyd (*Cincinnati: Author, 1902, pp. 44, figs. 80*).—A description is given of the Geasters, in which different parts are defined, and a classification of the genera and species is given. Two genera are recognized—Myriostoma, with 1 species, and Geaster, with 22 species.

The origin of species by mutation, D. T. MacDougal (*Torreya, 2 (1902), Nos. 5, pp. 65–68; 6, pp. 81–84; 7, pp. 97–100*).—An extended review is given of the origin of species by mutation, the theory and experiments of de Vries being described at considerable length (E. S. R., 13, pp. 324, 619).

The rheotropism of roots, F. C. Newcombe (*Bot. Gaz., 33 (1902), Nos. 3, pp. 177–198; 4, pp. 263–283; 5, pp. 341–362, figs. 15*).—The results of investigations of the rheotropic movement of roots, as shown by the examination of 32 species of plants, are given. These 32 species include all plants but 2 that have been examined for rheotropism, and of the 34 that have been studied, 20 showed positively rheotropic movements and 14 have been found insensitive. It is concluded that rheotropism can not, therefore, be said to be a general phenomenon.

The transformation of proteids during germination, G. André (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 17, pp. 995–998*).—Results of investigations in determining the transformation of proteids during the germination of beans are given. Of the proteid materials which enter into the seed, albumin disappears most quickly. Legumin, which represents about one-fourth of the total nitrogen of the unsprouted seed, diminishes rapidly but never completly disappears. The amid nitrogen, such as asparagin, etc., remains in solution after the separation of legumin and albumin, and increases with the process of germination, so that the nitrogen, which is about 4.2 per cent of the total nitrogen of the seed, increases to more than 55 per cent during germination. The proteid materials which are insoluble in water form the greater portion of the substance called conglutin by Rittenhaus. At the time the total weight of the plant is about that of the seed, or when the plant begins to take up nitrogen from the soil, the insoluble nitrogen increases rapidly, and this period is characterized by the formation of new albuminoids. These, on the one hand, are formed from the nitrogen taken from the soil and on the other by the conversion of the soluble amids and albuminoids.

Observations on transpiration, C. C. Curtis (*Bul. Torrey Bot. Club, 29 (1902), No. 6, pp. 360–373*).—An account is given of the variation of the transpiration due to differences in electric illumination, moisture, cuticular and intracellular transpiration, periodicity of stomata, etc. It was found that on cloudy and stormy days, when the intensity of the light is uniform, the transpiration curve shows a pronounced maximum near midday. The illumination of an electric light of 900 candle-power under uniform external conditions demonstrated a periodicity in the transpiration of several plants that corresponded in the main with the curves determined on cloudy days. Slight variation in the humidity of the atmosphere produced no change in the amount of transpiration that could be definitely determined. An increase of 8 per cent in the humidity resulted in a marked drop in the rate of transpiration. The curve of transpiration in the dark was frequently characterized by marked variations in comparison with the periodicity of light. There is believed to be a cessation of the vital action of the plant in the dark, and the retarding of the rate, together with its more pronounced regularity, is in keeping with the loss of vigor in the plant. The transpiration in the dark indicates that the stomata may be sufficiently open to allow the escape of vapor. This may be brought about in connection with the interchange of the gases in respiration or possibly by the independent action of certain stomata that are especially affected by the increased turgor tension or vapor tension of intracellular transpiration. The physiological character of transpiration is indicated by the periodicity of the opening and closing of the stomata. They are more responsive to the stimulus of light in the morning than in the afternoon, and the increased physiological activity in the morning is manifested in the more pronounced after effect following the illumination in the forenoon.

Contributions to the chemistry of chlorophyll, E. Schunck (*Proc. Roy. Soc.* [*London*], *69* (*1902*), *No. 455, pp. 307–312; abs. in Bot. Centbl., 89* (*1902*), *No. 14, pp. 389, 390*).—A report is given of the changes which chlorophyll undergoes in passing through the bodies of animals. The feces of animals fed green vegetable food did not contain any chlorophyll, but did show a number of substances that are apparently chlorophyll derivatives. One of these seems identical with phylloxanthin, while another resembles phyllocyanin, but is not identical with it. A third substance was found to which the name scatocyanin is given. The chemical and physical properties of scatocyanin are described.

The etiolation of plants, F. Noll (*Sitzber. Niederrhein. Gesell. Natur. u. Heilk. Bonn, 1901, pp. 9; abs. in Bot. Centbl., 89* (*1902*), *No. 13, pp. 363, 364*).—In addition to the well-known action of the absence of light in producing the etiolation of plants, the author describes forms which are due to other causes. The action of water under special circumstances may result in etiolation, and an inadequate amount of nitrogen or other important food constituent may result in a similar condition. Another form of etiolation may be produced by propagating such plants as Sempervivium and other rosette-forming plants by their flowering shoots.

The action of light on etiolated plants, H. Ricôme (*Rev. Gén. Bot., 14* (*1902*), *Nos. 157, pp. 26–40; 158, pp. 72–88; 159, pp. 120–137, pls. 3, figs. 10*).—The result of a series of investigations on the influence of light upon etiolated plants is reported. Potatoes, beans, lentils, castor beans, and a number of other plants were germinated and part of the seedlings kept in the dark for several weeks and afterwards brought into the light, a check lot being grown under normal conditions. The effect of etiolation upon the subsequent development of the plants is shown in the modified morphological and anatomical structures of the plants. It is shown that etiolated plants are capable of considerable development when brought into the light, provided they possess sufficient reserve material when brought from darkness into light, and that their capacity to grow has not been destroyed by the sudden change. The ultimate development and differentiation of leaves produced in darkness when brought into the light depends upon the state of development at the time of the change. The same is true for the internodes, although these organs do not attain their maximum development in the light. This effect seems to be brought about by a loss of water due to the disturbance of the equilibrium between the transpiration by the leaves and absorption through the roots. The organization acquired by a plant in darkness feebly affects its development in the light. The internodes of plants brought into the light are usually short and large and the leaves larger than normal, especially if in a dry atmosphere. This seems to be due to the activity of transpiration at the time and the leaves drawing the water from the internodes.

The influence of temperature on the absorption of mineral elements by etiolated plants, G. André (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 11, pp. 668–671*).—In a previous publication (E. S. R., 12, p. 613) the author has shown marked differences which exist between etiolated plants of maize and lupine which are kept in darkness. In the present paper the experiments are continued with maize and beans, in which the effect of temperatures of 15 and 30° C. on the absorption of mineral elements by etiolated plants is shown. Lime, which is most abundant in plants etiolated at 15°, is absorbed less abundantly by those which have been kept at 30° C. Potassium is taken up in the same manner. Phosphoric acid does not show appreciable variation from the above, while sulphur in the form of sulphates, which is present in considerable abundance in beans, is found to be 2½ times as abundant in the etiolated plants as in the seed. In the case of maize the sulphates are 7 times as abundant. Comparing plants etiolated at 15 and 30° C. shows a remarkable increase in the silicates present at the higher temperature, which is correlated with an increase of cellulose.

METEOROLOGY—CLIMATOLOGY.

Report of the meteorologist, W. H. Bishop (*Delaware Sta. Rpt. 1901, pp. 200–206*).—Monthly summaries of observations at 3 places in Delaware on temperature, pressure, precipitation, relative humidity, and prevailing winds during the year ended June 30, 1901, are given, with a summary of observations on temperature and precipitation during the calendar year 1900.

The summary for 1900 is as follows:

Annual summary of meteorological observations in Delaware, 1900.

Locality.	Temperature.			Total rainfall.	Number of days on which 0.01 in. or more of rain fell.
	Highest.	Lowest.	Mean.		
	Deg. F.	*Deg. F.*	*Deg. F.*	*Inches.*	
Newark	98 (July and August)	4 (February)	53.3	40.74	92
Dover	108 (July)	3 (February)	54.8	37.71	85
Seaford	102 (August)	7 (February)	56.1	36.69	80

Meteorological tables, T. S. Outram (*Minnesota Sta. Rpt. 1901, pp. 341–349*).—Tables prepared by the director of the Minneapolis office of the Weather Bureau are given, showing the monthly and yearly averages and departures from normal of temperature and precipitation, based on observations at some 64 places in Minnesota during the year ended June 30, 1901.

Rainfall variations (*Science, n. ser., 16 (1902), No. 393, p. 75*).—This is a brief note on a discussion by Hann[a] of variations in rainfall during long periods, based on data for monthly and yearly rainfall at Padua, 1725–1900; Klagenfurt, 1813–1900, and Milan, 1764–1900. There is shown to be a 35-year periodicity as regards dry and wet years, corresponding with the 35-year climatic period of Brückner, as follows:

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[a] Sitzungsber. Wien. Akad., 111 (1902), IIa.

Periodicity of wet and dry years.

Wet	1738	1773	1808	1843	1878	(1913)
Dry	1753	1788	1823	1859	1893	(1928)

Black rain in North Carolina, C. Baskerville and H. R. Weller (*Science, n. ser., 16* (*1902*), *No. 397, pp. 215, 216*).—An abstract of a paper read before the North Carolina section of the American Chemical Society at Raleigh May 17, 1902, which refers briefly to a chemical examination of a sample of black rain from Louisburg, N. C.

Cyclones and agriculture, L. Dumas (*L'Ing. Agr. Gembloux, 12* (*1902*), *No. 11, pp. 523–531, figs. 2*).—A general discussion of the movement and course of cyclones and of the damage which they do to agriculture.

WATER—SOILS.

Waters (*California Sta. Rpt. 1899–1901, pt. 1, pp. 49, 50*).—The results of examinations of 310 samples of water from different parts of the State, with reference to their adaptability for domestic or irrigation purposes, are briefly summarized. It was found that 70 per cent of the lake and stream waters, 56 per cent of the spring waters, 56.7 per cent of the common well waters, 47.8 per cent of the reservoir and ditch waters, and 31.6 per cent of the artesian well waters were unsuitable for domestic and irrigation purposes.

The purification and sterilization of water, S. Rideal (*Jour. Soc. Arts, 50* (*1902*), *Nos. 2591, pp. 717–725; 2592, pp. 729–737; 2593, pp. 741–750; 2594, pp. 755–767*).—A series of lectures giving a very complete discussion of the subject.

Studies of the subterranean hydrology of the region of Cadereyta Méndez, State of Querétaro, 1901, J. DeD. Villarello (*Bol. Sec. Fomento* [*Mexico*], *1* (*1901*), *No. 5, IV, pp. 75–91; 1* (*1902*), *No. 6, IV, pp. 135–152*).

Soil analyses, C. L. Penny (*Delaware Sta. Rpt. 1901, pp. 77–82, fig. 1*).—"As a preliminary step to a general study of the soil, analyses were made for potash, phosphoric acid, and lime in 7 soils selected from various places in Kent County, all in the vicinity of Dover." The results of these analyses, as well as of mechanical analyses of the soils, are reported with a description of the methods used in sampling the soils and in determining potash. In each case the surface soil was sampled to the line of demarcation between surface and subsoil, the depth varying from 6 to 10 in. in different cases. The subsoil was sampled to a total depth from the surface of 36 in., or 25 to 30 in. below the bottom of the surface soil. The samples were taken either with a brass tube sampler or by means of a spade. The method of determining potash was substantially that described in previous publications (E. S. R., 10, pp. 134, 514), except that the rotary device used in the acid digestion of the soils was modified so that the steam chest containing the flasks is inclined toward the horizon at an angle of 22°, the flasks being placed in the chest with their necks parallel to the axis of rotation. In this way the necessity for tightly closing the flasks, with the consequent danger of collapse, is avoided, and it is claimed that while the agitation is not so violent as in the original device, the conditions are quite as favorable for the solvent action of the acid. The soil solutions were made with hydrochloric acid of 20.26 per cent strength (1 liter of acid to 500 gm. of soil), the digestion being maintained at steam heat for 12 hours. Parallel determinations were made in samples of soil ignited to bright-red heat and those not so ignited. It was found that the amount of potash soluble in strong acid at steam heat was in most cases more than doubled by ignition. A slightly larger percentage of potash was found in the subsoil than in the surface soil, the reverse being true in case of lime.

The soils of Dorset, D. A. GILCHRIST and G. A. LUXMOORE (*Jour. Reading Col.* [*England*], *1900, Sup. 10, pp. 28; 1902, Aug., pp. 34*).—Reports are here given of results of examinations of the second and third installments of 20 samples each of Dorset soils investigated under the terms of an agreement explained in an earlier report (E. S. R., 11, p. 327). The reports give the results of laboratory examinations and field observations.

Gooselands of Glenn and Colusa counties, R. H. LOUGHRIDGE, T. L. KNOCK, and J. B. DAVY (*California Sta. Rpt. 1899–1901, pt. 1, pp. 21–33*).—A brief account is given of mechanical and chemical examinations, and studies of alkali conditions, physical characteristics, and distinctive flora of these lands, which derive their name from the fact that they are the resort of large flocks of wild geese which are attracted by the accumulation of water on the surface of the soils during the winter rains. The soils cover a large area in the counties of Glenn and Colusa, bordered by the alluvial belt of the Sacramento River on the east and the valley plain of the Sacramento Valley on the west, and reach from Willows on the north to within a few miles of Arbuckle on the southeast. The region varies in width from about 15 miles in its widest place on the north to about 6 miles on the south. It has a length of about 30 miles. The accumulation of water is due to an impervious subsoil, and the soil is strongly impregnated with alkali, the predominant ingredient of which is sodium sulphate. The alkali is believed to be derived mainly from the alkali waters and sediments of Willows Creek, which empties into this area. A combined system of warping and drainage is suggested as a possible means of correcting the present unsatisfactory condition of these lands. "The most abundant and distinctly characteristic plants of the gooselands proper are, in order of prevalence: Alkali heath (*Frankenia grandifolia*), gum weed (*Grindelia camporum*), salt grass (*Distichlis spicata*), gold fields (a species of *Baria* or *Lasthenia*, especially prevalent on adobe patches), cressa (*Cressa cretica truxillensis*), sida (*Sida hederacea*), long-winged pepper cress (*Lepidium latipes*), tissa (*Tissa leucantha*), and prostrate saltbush (*Atriplex fruticulosa*)."

Study of the climate and soil of the Polder region of Belgium (*Monographie agricole de la région des Polders. Brussels: Ministry of Agriculture, 1902, pp. 1–14*).—The subject is treated in the same manner as in previous reports of this series on other regions (E. S. R., 13, p. 723). The soils of the region are compact, tenacious, and of marine or fluvio-marine origin. They contain from 20 to 30 per cent of clay. In virgin state they are rich in fertilizing constituents, but have in many cases become impoverished by continuous cropping without manure, especially as regards nitrogen and phosphoric acid.

An investigation of soil sediments, as formed under arid conditions, with regard to their plant-food value, L. M. TOLMAN (*California Sta. Rpt. 1899–1901, pt. 1, pp. 33–42*).—Chemical analyses of the different sediments obtained in mechanical analyses of a number of California soils are reported and compared with similar analyses of sediments obtained in analyses by Loughridge of soils from humid regions. The results indicate that the clay of arid soils is not so important a factor in plant nourishment as that of humid soils and that there is a rather general distribution of plant food through all the sediments, the plant food being in about the same condition in all of them.

A contribution to the action of fertilizer salts on the physical properties of soils, A. MITSCHERLICH (*Fühling's Landw. Ztg., 51 (1902), No. 16, pp. 580–588*).—The most marked effect of the use of salts on soils is to cause them to become more compact; the influence on moisture content is thought to be of no great importance.

The sugar beet as a reclaimer of arid and alkali regions, H. C. Myers (*Jour. Soc. Chem. Ind., 21 (1902), No. 12, pp. 834–838, figs. 4*).—This is the second article on this subject by the same author (E. S. R., 13, p. 641), and gives results of observations on the growth of sugar beets on virgin alkali soil in West Weber, Utah, where cultivation has never been attempted, the land being irrigated from artesian wells. Analyses of soils, water, and beets are given.

Studies on the distribution of lime in the soils of vineyards, J. Dufour and H. Faes (*Chron. Agr. Canton Vaud, 15 (1902), Nos. 15, pp. 437–445; 16, pp. 480–487*).

Occurrence and importance of soluble manganese salts in soils, E. E. Ewell (*Science, n. ser., 16 (1902), No. 399, p. 291*).—An abstract of a paper presented to the American Chemical Society at its summer meeting, which briefly reports the results of an examination of a soil which failed to grow leguminous plants and which was found to contain a very considerable amount of manganese compounds soluble in water, more in fact than of lime.

Agriculture in its relations to bacteria and other ferments, H. W. Wiley (*Jour. Franklin Inst., 154 (1902), Nos. 2, pp. 81–90, pl. 1, figs. 3; 3, pp. 161–169, pl. 1, fig. 1*).—This article deals almost exclusively with the transformations of nitrogen in the soil under the influence of micro-organisms—nitrification, denitrification, and assimilation of nitrogen by plants—incidentally describing the methods followed in the Bureau of Chemistry of the Department in sampling and examining various soils used in studies on nitrification. In discussing the problem of exhausted soils the author takes the somewhat unusual position "that the leguminous crops will not grow except in a reasonably fertile soil and hence it is useless to expect the restoration of fertility to an exhausted soil by a natural means. . . . With such soils the best recourse is to nitrogen already available, that is, some form of nitric acid. The cheapest source at present is sodium nitrate or Chile saltpeter."

Development and distribution of nitrates in cultivated soils, F. H. King and A. R. Whitson (*Wisconsin Sta. Bul. 93, pp. 39, figs. 6*).—This is a detailed account of investigations more briefly reported elsewhere (E. S. R., 13, p. 930). The additional data include the results of a study of the variation in nitrification in soil and subsoil, which show greatest development of nitrates in the surface 6 in. of soil and the least in the third 6 in.; also the results of observations on the transformation of nitrogen in a galvanized iron lysimeter 5 ft. deep and having an area of 37.5 sq. ft., and on the development of nitrates in fallow and immediately adjacent soil under crops.

Investigations on the determination and composition of humus, and its nitrification, C. Rimbach (*California Sta. Rpt. 1899–1901, pt. 1, pp. 43–48*).—Laboratory experiments on the rate of nitrification of humates of lime and magnesia prepared from soils are reported, which verify "the assumption made heretofore by Professor Hilgard and others that Grandeau's *matière noire* is a direct source of nitrogen through nitrification." They also tend to confirm Hilgard's conclusion "that humus containing a high percentage of nitrogen, such as is found in the soils of the arid regions, will yield larger amounts of nitrates in the same time than will that of lower nitrogen percentages, and that conversely, low nitrogen percentages may fail to supply a sufficiency for plant growth." Grandeau's method for the determination of humus and of nitrogen in humus was investigated, with the following results:

"By leaching with chlorhydric acid and water a certain quantity of humus, varying in the different soils, is lost to the subsequent extraction with ammonia.

"The content of nitrogen of the soda extract, being different from that of the ammonia extract, can not be directly referred to the content of organic matter of the latter.

"In the determination of organic matter and nitrogen in the ammonia extract, the quantity of combined ammonia must be considered. . . . It is evident that the percentages of humus heretofore determined are too high, inasmuch as the combined ammonia, which is about 5 per cent of the ash-free ammonium humate, has been erroneously calculated as organic matter. . . .

"The question still remains whether sodic or ammonic solution, and in what strength, satisfy best the requirements of a solvent for humus substance, regarded as the sum of organic substances, decomposed or not, that are immediately available for the plants."

Studies in soil bacteriology, F. D. Chester (*Delaware Sta. Rpt. 1901, pp. 50–73*).—This is a preliminary report on uncompleted investigations relating mainly to the study of methods of determining the number of bacteria in soil samples, the numerical distribution of bacteria in soil, and the conditions (acidity, influence of lime and other fertilizers, etc.) affecting the number and distribution of the soil organisms. The results of pot experiments with lime and other fertilizers indicate that—

"(1) Lime diminishes the acidity of the soil as measured by the method of Wheeler [E. S. R., 11, p. 1003], but not in the degree which would be expected. It would, therefore, appear that soil acidity must in a measure be due to substances which the lime does not neutralize. The basic slag slightly reduced acidity, while the muriate of potash was without effect.

"(2) The study of pots to which nothing was applied shows that the number of bacteria undergoes fluctuations. In other words, death of bacteria and multiplication are concurrent phenomena, and there may be gain or loss dependent upon conditions, favorable or unfavorable, during certain intervals.

"(3) In the pots which received no treatment a general level of bacteria was maintained throughout the experiment.

"(4) The addition of lime had a marked tendency to increase the number of bacteria in the soil, which was most marked when the larger quantities were applied.

"(5) Neither Thomas slag nor muriate of potash had any appreciable effect in increasing the number of bacteria in the soil."

Elements of agricultural geology; a scientific aid to practical farming, P. McConnell (*London: Crosby Lockwood & Son, 1902, pp. X + 329, pls. 8, figs. 25, map 1*).—This book, which is stated to represent 25 years' systematic study of the subject, contains chapters on the great ice age (introductory), origin and formation of soils, mineralogy of soils, physiography of soils, water supply, formations and farming, and evolution of live stock. The statements and conclusions are based on observations not only in Great Britain but in other countries, including America. As a result of his observations in New England the author supports Johnston in maintaining that an intimate relation exists between rocks and soil in that region, contrary to the very recently accepted views supported by Merrill and others that such a relation seldom exists. Five chapters, covering 115 pages, are devoted to the relation of geological formations in the British Islands to the kind of farming practiced, the thesis upon which the discussion of this phase of the subject is based being "that every rock formation has a soil peculiar to itself, and wherever rocks throughout the world have similar lithological characters the soils derived from such will be similar, and with a corresponding influence on the farming thereof—provided that no disturbing agencies have been at work and the materials have been allowed to accumulate in situ." Special attention is also given to the evolution of live stock (horses, cattle, sheep, and swine) as traced through geological remains and influenced by geological formations, four chapters covering 55 pages being devoted to this subject. In discussing this topic the author proceeds upon the theory that "similarity of formations has produced similarity of breeds, just as differences of formations have produced differences among breeds. The converse of this, again, is true, for we find on the American continent, on the prairies, a region of land very similar to Eastern Europe, and this similarity tends to wipe out the differences between breeds. British breeds have a tendency there to lose their characteristics, and would in time, if allowed freedom, revert back to some common form when continuously bred under one set of geological surroundings. . . . Even the 'original variety or breed,' if it can be traced to its beginning, will be found to have been influenced or 'developed' by the geological conditions of its habitat." In method of treating the subject this book differs essentially from Risler's *Géologie agricole* and the various available treatises on origin, formation, and characteristics of soils.

FERTILIZERS.

A study of the phosphorus nutrition of plants, T. SCHLOESING, JR. (*Compt. Rend. Acad. Sci. Paris, 134* (*1902*), *No. 1, pp. 53–55*).—A study was made of soils, one of which was comparatively rich in soluble phosphates, the other quite poor. The plant experimented with was maize, and the amount of phosphoric acid taken up from the different soils is shown. In the soil rich in phosphates the phosphoric acid soluble in water was 1,012 mg. per 36 kg. of soil, while that taken up by the plants grown in pots containing this amount of soil was 1,115 mg. In the soil poor in this constituent the amount of soluble phosphoric acid was 199 mg., while the plants obtained from the soil 451 mg. This shows that while the soluble phosphates are readily absorbed it is not necessary that they should be entirely in a state of solution, as the roots of the plant are able to dissolve the compound without the intervention of soil water.

The fertilizing value of deep-stall and yard manure, M. GERLACH (*Jahresber. Landw. Vers. Stat., Jersitz-bei-Posen, 1900–1901, p. 24; abs. in Chem. Centbl., 1902, II, No. 11, p. 764; Centbl. Agr. Chem., 31* (*1902*), *No. 8, p. 509*).—The deep-stall manure used in the pot experiments here reported contained 0.521 per cent of total nitrogen and 0.086 per cent of water-soluble nitrogen. The yard manure contained 0.446 per cent of total nitrogen and 0.022 per cent of water-soluble nitrogen. The results of the experiments showed that weight for weight the deep-stall manure gave a much larger yield than the yard manure, but the addition of potash and phosphoric acid increased the yield in both cases. The nitrogen of the yard manure was much less effective than that of the deep-stall manure.

The influence of additions of straw, peat, manure, etc., on the action of nitrate nitrogen and the action of Alinit, M. GERLACH (*Jahresber. Landw. Vers. Stat., Jersitz-bei-Posen, 1900–1901, pp. 22–25; abs. in Chem. Centbl., 1902, II, No. 11, p. 763*).—Applications of straw diminished the action of nitrate nitrogen to a considerable extent; peat with nitrate nitrogen reduced the yield of grain (barley) somewhat, but increased that of straw; cow manure with straw and nitrate had almost no influence on the yield. Alinit in presence of an application of carbonaceous matter was without effect on barley.

Note on the effect of manuring upon the milling property of the grain, F. B. GUTHRIE and G. W. NORRIS (*Agr. Gaz. New South Wales, 13* (*1902*), *No. 7, pp. 727–729*).—A preliminary report on the milling quality of wheat grown on plats fertilized with sulphate of ammonia, nitrate of soda, dried blood, superphosphate, and sulphate of potash in various combinations.

The preservation of manure with superphosphate-gypsum, kainit, and sulphuric acid, T. PFEIFFER, F. MOSZEIK, O. LEMMERMANN, and E. WÄLLNITZ (*Arb. Deut. Landw. Gesell., 1902, No. 73, pp. 49*).—A large number of experiments on this subject are reported. The general conclusions reached are that there is a considerable loss of nitrogen from manure in the stall. With daily removal of the manure the loss was less than when it was allowed to remain for 7 days under the animals. This, however, should not be taken as contradictory to the favorable results obtained in the deep-stall method. The loss of nitrogen both in the stall and in the heap was greater in the summer than in winter. Kainit and superphosphate-gypsum in amounts of from 1.5 to 2 kg. per 1,000 kg. of live weight of animal were without effect in preventing loss of nitrogen. The addition of sulphuric acid reduced the loss of nitrogen, but not to a sufficient extent to make the practice profitable. The indications are that the nitrogen escaped from the manure mainly in elementary form.

Conservation of cow dung, D. N. Mookerji (*Ann. Rpt. Burdwan Expt. Farm 1900–01. Dept. Land Records and Agr., Bengal, 1902, pp. 12, 13*).

On sawdust as fertilizer, G. Loges (*Deut. Landw. Presse, 29* (*1902*), *No. 76, p. 622*).—The objections to sawdust as a fertilizer are pointed out.

Chemical-agricultural investigations on the fertilizing value of beans, E. de Cillis (*Staz. Sper. Agr. Ital., 35* (*1902*), *Nos. 2–3, pp. 85–128, fig. 1; 4–5, pp. 289–368; 6, pp. 441–495, figs. 5*).—A discussion based upon a large amount of analytical and experimental data of the extent to which soils are enriched in nitrogen by the growth of beans, the influence on the succeeding crop, and the possibility of increasing the fertilizing capacity of beans.

Studies in denitrification, E. B. Voorhees (*Jour. Amer. Chem. Soc., 24* (*1902*), *No. 9, pp. 785–823*).—The plan, scope, and some of the results of the investigations here reported have already been noted (E. S. R., 13, p. 727). The first part of the article is a review of other investigations on the subject, containing a list of references of 80 entries; the second part summarizes the results of experiments during 3 years at the station, in cylinders of galvanized iron 4 ft. long and 23.5 in. in diameter, on the availability of the nitrogen of fresh and leached solid and liquid cow manure, of sodium nitrate, of ammonium sulphate, and of dried blood alone and combined. The amounts of nitrogen applied and recovered in the crops (corn, oats, and millet) were used as a measure of the availability. The results, which are reported in detail, indicate that with applications of manure not exceeding 20 tons per acre there was no denitrification in the cylinder tests, although laboratory work had shown "clearly that nitrates when in contact with manure are destroyed by the organisms contained in the latter; that this destruction of nitrates is essentially a reducing process; that the larger portion is set free as gaseous nitrogen, and that a part of it is converted into ammonia and part of it into insoluble organic nitrogen, not suited to supply the immediate nitrogen requirements of the growing crop."

By-product of ammonia and soda manufacture as fertilizers, A. M. Grimm (*Ztschr. Landw. Versuchsw. Oesterr., 5* (*1902*), *pp. 918–920; abs. in Chem. Centbl., 1902, II, No. 11, p. 761*).—This material contains 32 per cent of lime in air-dry condition and 20 per cent in the fresh condition.

On the use of calcium-carbid residue in agriculture, M. Gerlach (*Fühling's Landw. Ztg., 51* (*1902*), *No. 3, pp. 81–87; abs. in Chem. Centbl., 1902, II, No. 11, p. 764*).—This material, which contains in moist condition 49.52 per cent of free water, 7.33 per cent of calcium carbonate, 40.69 per cent of calcium hydrate, and 0.43 per cent of insoluble matter, is recommended as a useful lime fertilizer.

Analyses of commercial fertilizers and manurial substances, C. A. Goessmann (*Massachusetts Sta. Bul. 83, pp. 24*).—Analyses are reported of 175 samples of fertilizers collected in the course of regular fertilizer inspection during 1902, and of 58 samples of fertilizing materials sent to the station for examination, including mixed fertilizers, wood ashes, lime ashes, cotton-hull ashes, coral formation, dry ground fish, ground bone, sulphate of potash, carbonate of potash, nitre lime, vegetable potash, acid phosphate, tobacco stalks, wool waste, castor pomace, and soils.

Analysis of commercial fertilizers, J. L. Hills, C. H. Jones, and B. O. White (*Vermont Sta. Bul. 93, pp. 83–126*).—This bulletin contains a report of analyses and valuations of 136 brands of fertilizers, the output of 8 companies, sampled and examined during the spring of 1902; a discussion of the results of the inspection; a comparison of the average composition of fertilizers in 1902 and in previous years; and formulas and directions for making home mixtures of fertilizers. Nine-tenths of the brands examined were up to or above the guaranty, and none failed to furnish the commercial equivalent of the guaranty. As a rule the quality of the crude stock used was apparently good. Nearly a third of the brands contained no water-soluble nitrogen. Sulphate of potash, claimed to be present in five-sixths of the brands, was actually found in only one-sixth. In some cases the phosphoric acid was largely in insoluble or reverted forms. The average selling price approximated $28.23, the average valuation $20.18. The average composition of the fertilizers was somewhat higher than that of last year. Tables are given containing formulas in which relatively small, medium, and large quantities each of nitrogen, available phosphoric acid, and potash are combined with varying quantities of the other ingredients, and their use in the preparation of home-mixtures for different purposes is explained.

Licensed commercial fertilizers, F. W. Woll and A. Vivian (*Wisconsin Sta. Bul. 92, pp. 3-12*).—Analyses of 9 samples of fertilizers licensed for sale in Wisconsin in 1902 are reported, with notes on the sources and forms of nitrogen, phosphoric acid, and potash in fertilizers; the purchase and use of fertilizers; the valuation of fertilizers; and the value of inspection.

Fertilizers, T. Macfarlane (*Lab. Inland Rev. Dept. Ottawa, Canada, 1902, Bul. 81, pp. 41*).—Analyses and valuations of 106 samples of fertilizers furnished by manufacturers and importers, and 85 collected in the open market in Canada, are reported, with notes on the nature and use of natural manures and commercial fertilizers.

Results of fertilizer control, 1900–1901, G. Thoms (*Die Ergebnisse der Dünger-Kontrole, 1900–1901. Riga: Jonck & Poliewsky, 1902, pp. 55*).—This is the usual annual summary of the results of the fertilizer control of the experiment station at Riga, Russia, with a discussion of various phases of the fertilizer question which have been the subjects of studies by different investigators during the period referred to, including denitrification, soil inoculation, Alinit, etc.; conservation and care of manure; phosphatic, nitrogenous, and potassic fertilizers; the occurrence of pure Peruvian guano; poudrette and similar manures; liming and manuring; change in weight of certain fertilizers on exposure to the air; the influence of water and fertilizing on the composition and ash of potatoes; determination of the fertilizing requirements of typical soils; the surface treatment of upland moor soils; the importance and possibility of partially replacing barnyard manure with commercial fertilizers in grape culture; fertilizers for field culture of cucumbers; commercial fertilizers for potatoes; fertilizing meadows with kainit, superphosphate, and Thomas slag; fertilizing potatoes with poudrette. All of the more important articles referred to have been noted in the Record.

FIELD CROPS.

The [California Culture] substations, C. H. Shinn (*California Sta. Rpt. 1899-1901, pt. 1, pp. 124–142, figs. 4*).—Notes are given on the results obtained with different crops at the Foothill, Southern Coast Range, San Joaquin Valley, and Southern California Culture substations during a series of years. Macaroni wheats grown in the different localities varied considerably in quality, the greatest change and increase in starch being observed at Amador. The hardy Algerian wheats under test deteriorated less at some stations than at others. At Tulare the hardy wheats on trial tillered more and yielded better from year to year. Vetches have been tested from 3 to 10 seasons. The following are recommended: *Vicia villosa*, *V. sativa cordata*, *V. sativa*, *V. narbonensis*, *V. bythinica*, and *V. fulgens*. A yield of over 17 tons of green forage per acre was obtained from one cutting of *Atriplex nummularia*, the plants being 2 years old. *A. pamparum* has also given promising results. *Rhagodia spinescens inermis* and *R. linifolia* have shown great forage value and great endurance of drought and frost. Their leaves contain less salt than species of Atriplex. *Rhagodia linifolia* is considered adapted to the foothills of the Coast range. The African stock melon, also called Tsama or Khama melon, yielded over 19 tons per acre as against 10 tons produced by Kansas stock melon. This variety has given a good yield with an annual rainfall of 5.7 in.

Fertilizer experiments, C. H. Shinn (*California Sta. Rpt. 1899–1901, pt. 1, pp. 89–95, figs. 4*). Tests with fertilizers for wheat, oats, and barley on several different soils were made at the Foothill Substation, and with wheat at the Southern Coast Range Substation. The fertilizers consisted of nitrate of soda, alone or with muriate of potash and Thomas phosphate. There were increased yields with the fertilizers, which were profitable in every case, whether the cereal was grown for grain or hay.

Report on cultural tests in 1900, A. Damseaux (*Bul. Agr.* [*Brussels*], *18* (*1902*), *No. 1, pp. 9–22*).—The results of variety and cultural tests with wheat, oats, sugar and forage beets, colza, and lupines are briefly considered. The culture of abutilon for fiber is discussed and the results of a culture test briefly given.

Cooperative field trials with cereals, potatoes, and root crops in Norway, 1901, B. Larsen (*Christiania, 1901, pp. 24*).—The trials were conducted, under the direction of the Agricultural College at Aas, Norway, on 129 plats located on farms in different parts of the country, and on 9 plats on the college grounds. Comparative variety tests were made with oats, barley, potatoes, root, and hay crops. The varieties which produced the best average yields during the years 1889–1900 were as follows: *Oats*—Baseler, Lühneburger Kley, Duppauer, with average yields of about 56 bu. per acre; *barley*—Malum, Björneby, and Finne, six-rowed square varieties, yielding about 40 bu. per acre; *potatoes*—Bodö Original, Juvel Gra. and Lydia Gra. with the highest average yield, of over 400 bu. per acre. The best varieties of the root crops were Dale Hybrid yellow turnip, Greystone white turnip, Bangholm and Lawson ruta-bagas, Hvid Päl and Red Oberndorfer fodder beets; Breustedt Neuere Zucht and Schreiber Specialty sugar beets; and Altringham and Red carrots.—F. W. WOLL.

Analyses of root crops at different times during storage, H. P. Larsen (*Landtmannen, 12* (*1901*), *No. 18, pp. 282–284*).—Monthly analyses of fodder beets, ruta-bagas, and turnips from the time of harvesting until the end of May showed steadily decreasing contents of dry matter. The average results for fodder beets were as follows: October, 13.64 per cent; November, 13.06 per cent; December, 12.82 per cent; January, 12.52 per cent; February, 11.88 per cent; March, 11.37 per cent; April, 11.07 per cent, and May, 10.64 per cent. This represents a loss of 3 per cent in seven months, or of 22 per cent of the original dry matter in the beets. Ruta-bagas contained 12.47 per cent dry matter in November and 8.58 per cent in May, and turnips 9.53 per cent and 5.84 per cent for the same months, respectively. The larger the roots the lower the percentage of dry matter and the yield of dry matter per acre from the same number of plants. Data obtained with the "brine test" showed that in general a high specific gravity is found in beets low in dry matter. Lots of 40 beets each having a specific gravity of 0.81, 1.06, 1.12, 1.30, and 1.31 contained 14.12, 13.13, 13.19, 12.41, and 12.82 per cent of dry matter, respectively. Analyses of different parts of beets and of smooth and irregularly shaped beets are also given.—F. W. WOLL.

Chemical composition of some leguminous plants at different stages of development, H. G. Söderbaum (*K. Landt. Akad. Handl. Tidskr., 40* (*1901*), *No. 5–6, pp. 364–381*).—Analyses of *Astragalus glycyphyllus*, *Lathyrus pratensis*, *Medicago sativa*, *Melilotus alba*, *Orobus niger*, *Trifolium pannonicum*, and *Vicia dumetorum* are reported. The samples for analyses were taken June 7, when the flower buds were forming; June 21, at the beginning of the blossoming period; July 5, when the plants were in full bloom, and August 15, after the blossoming period had ended. Moisture, ash, total nitrogen, ether extract, crude fiber, pentosans, and albuminoids were determined. In all cases but two the percentages of pentosans, like those of crude fiber, increased regularly with the age of the plants. The content of pentosans in Astragalus was 11.05, 14.01, 15.20, and 17.47 per cent in samples taken on the 4 different dates respectively. The pentosan content for the entire period varied from 8.07 to 12.10 per cent in Lathyrus, from 13.93 to 16.79 per cent in Medicago, from 11.15 to 16.88 per cent in Melilotus, from 12.12 to 18.78 per cent in Orobus, from 11.80 to 13.86 per cent in Trifolium, and from 11.02 to 15.81 per cent in Vicia. In the 2 cases where a cutting showed a lower content of these substances than that immediately preceding, the differences amounted to less than 0.1 per cent. The most rapid increase in the content of pentosans was found in case of Astragalus, with almost 3 per cent in 14 days, while the greatest increase during the whole period occurred in Orobus, with 6.66 per cent, and the smallest in Astragalus, with 2.13 per cent.

As a general rule, with the advance of the growing period a decrease was found in ash materials, nitrogenous constituents, amids, albuminoids, and digestible and indigestible albuminoid nitrogen, while an increase occurred in crude fiber and pentosans. In the ether extract and nitrogen-free extract no definite regular changes were observed. As the age of the plants increased the coefficient of digestibility of the protein decreased—in Astragalus from 88.9 to 82 per cent, in Lathyrus from 72.4 to 57.7 per cent, in Medicago from 90.2 to 81 per cent, in Melilotus from 90.3 to 84.8 per cent, in Orobus from 89.5 to 72.5 per cent, in Trifolium from 87.1 to 78.1 per cent, and in Vicia from 88.7 to 79.2 per cent. The author calls attention to the fact that in many cases the relative rank of these plants, as determined by their contents of digestible crude protein, digestible albuminoids, or by the digestion coefficients for the nitrogen compounds, changed radically only within 14 days, and further dwells upon the importance of accompanying all analyses of forage plants with exact information as to the time of cutting and the stage of development of the crop at the time of cutting.—F. W. WOLL.

Barley, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 3 (1902), No. 7, pp. 213–215*).—The conditions required for the successful culture of barley are described. The plant food removed from the soil in crops of 2-rowed and 6-rowed varieties is shown in a table.

Fertilizers for barley, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 3 (1902), No. 9, pp. 276–278*).—The author reviews the results of fertilizer experiments and variety tests with barley. Chevalier Richardson and Hanna barley yielded 20 per cent more than the Champagne variety.

Observations on the culture of beets, BERTHAULT and BRÉTIGNIÈRE (*Ann. Agron., 28 (1902), No. 1, pp. 30–56*).—The results of experiments with beets in 1899, 1900, and 1901 are reported. A comparison of 4 varieties in 1899 resulted in the best yields for the varieties ordinarily grown for the manufacture of alcohol, and commonly called distillery beets. In total amount of dry matter produced the fodder-beet variety Jaune Ovoïde de Barres stood lowest, with a yield of 4,271 kg. per hectare, and the variety Brabant à collet vert stood highest—6,165 kg. Planting in drills 40 cm. apart with 35 cm. between plants in the drill gave best results. It was noticed that close planting had raised the sugar content of the fodder-beet variety, still it contained nearly 5 per cent less sugar than either intermédiaire Desprez or Brabant à collet vert. The authors conclude that even in a dry season and on an inferior soil the varieties used for distillery purposes are to be preferred to the fodder-beet varieties, and that close planting should be practiced. The different varieties did not give similar results when grown at varying distances. The variety Jaune Ovoïde de Barres gave the smallest yield with the closest planting, while Brabant à collet vert gave the smallest yield with the widest planting. The question of distance was further investigated in 1900 with the result that 40 cm. between rows, from 35 to 40 cm. between plants in the row, gave the best returns in the largest number of cases. These distances represent from 6 to 6½ plants per square meter, or 60,000 to 65,000 plants per hectare.

The results of 1901 indicate that the varieties producing a long-shaped beet may be grown in rows 50 cm. apart and the plants narrowed down to 25 cm. in the row, while the ovoid-shaped varieties may be planted in rows at closer intervals, but giving the plants more space in the row. Close planting, owing to the increase in the number of beets, was found to increase the cost of production, but in most cases this was more than compensated for by the increase in yield.

Observations on beet culture, BERTHAULT and BRÉTIGNIÈRE (*Ann. Agron., 28 (1902), No. 2, pp. 65–102, figs. 10*).—The work here reported consisted of a study of beet-seed production and variety tests of beets grown for the manufacture of sugar and alcohol and for feeding purposes. The tabulated results of the variety tests show the yield of beets and sugar per hectare, together with the financial returns for each variety. In studying the seed production of beets in 1899, 1900, and 1901, the methods of growing the mother beets from seed and from cuttings, grafts, or by division were compared. A beet allowed to seed in the ordinary way in 1899 yielded 93 gm. of seed, while from 30 cuttings and two sections made from another beet 222 gm. of seed were obtained. Although 30 cuttings were made, only 7 grew, and of these 4 produced seed. The 4 seed-producing beets contained an average of 13.73 per cent of sugar and the other 3, which did not throw up seed stalks, contained an average of 15.52 per cent. The original beet from which the cuttings and sections were made had a sugar content of 15.12 per cent. The following year the three remaining beets were permitted to seed, producing 100.4 gm., and the beets obtained from the two sections of the original were each cut into three pieces and planted for seed, yielding for the 6 plants 23 gm. This made a total of 345.4 gm. of seed from one beet in 2 years.

The seed obtained in 1899 was sown in 1900, but the results were quite irregular. This season tests were carried on with three beets, the first being grown for seed in the ordinary way, the second was used to furnish cuttings, grafts, and sections for growing seed beets, and the third was cut into four sections for the same purpose. The beet grown in the ordinary way produced 69.7 gm. of seed. Of 24 cuttings of the second beet, 22 beets were obtained perfectly homogeneous in foliage and form, but only one produced seed, which, however, was of no value. The cutting which produced seed contained the central bud. In grafting, a cylinder 7 mm. in diameter and about 3 cm. long, with a growing bud at the top, was taken from the upper part of the beet and inserted on the upper surface of the beet used as a stock after the crown had been removed. This procedure is described in detail, and the value of top and side insertion of the scion on the stock beet discussed. The grafts grew with varying success, but no seed is reported to have been obtained. After the cuttings and grafts had been secured from the second beet, it was divided into four sections, which were planted, but did not yield seed. The third beet was divided into four sections, which were planted separately. Three plants were obtained, and these yielded 77.5 gm. of seed.

In 1901 the seed obtained by the different methods of propagation was tested and the results obtained are reported. A second seed production by a beet which had furnished cuttings the previous year did not seem profitable. The seed obtained from the main seed stalk was found much superior to seed produced on the branches. Grafting is not considered a satisfactory method of propagation for seed beets. In the case of cuttings it is necessary to determine the conditions which assure their seed production.

The influence of distance between plants in the row on the yield of forage beets (*Deut. Landw. Presse, 29 (1902), No. 11, p. 83*).—Forage beets were grown from 8 to 9 in. apart in 14-in. drills, and from 10 to 12 in. apart in 16-in. drills. The results were in favor of the closer planting.

The influence of distance on the yield and quality of fodder beets, A. von Kötteritz (*Fühling's Landw. Ztg., 51 (1902), No. 4, pp. 155, 156*).—A number of varieties of beets were grown in 14 and 16 in. rows with the plants about 8 in. apart in the 14-in. rows and from 10 to 12 in. apart in the 16-in. rows. The yield was slightly and the quality largely in favor of the narrow planting.

Comparative tests of forage beets and varieties of a medium sugar content, Desprez (*Semaine Agr., 22 (1902), No. 1084, pp. 59, 60*).—A summary of results is given which shows that varieties of a medium sugar content are more profitably grown for feeding purposes than the ordinary varieties of forage beets.

Broom corn, W. R. Dodson (*Louisiana Stas. Bul. 67, 2. ser., pp. 806–816, figs. 4*).—This bulletin is a brief popular treatise on the growing and curing of broom corn.

The improvement of the castor plant, W. R. Shaw (*Oklahoma Sta. Bul. 54, pp. 10*).—This bulletin discusses the improvement of the castor plant and suggests methods by which this object may be attained. It is pointed out that the relative value of varieties depends mostly upon the percentage of oil in the seeds, the quantity of seeds produced, the cost of harvesting, and the simultaneous ripening of the pods on a spike and on the different spikes of a plant. Upon the equality of ripening depend the cost of harvesting and the percentage of seed of the total product which may be gathered. In summing up the discussion of seed selection the author recommends to "select the best and earliest seed of a crop for planting, and when practicable select this seed from the best plants of a stand." The method of grading castor seed on the market is described.

The culture of the castor bean in Algeria, C. Rivière (*Agr. Prat. Pays Chauds, 1 (1902), No. 6, pp. 747–751*).—The culture of the castor bean in Algeria is described and the varieties grown are briefly noted.

Cotton culture, C. Farmer (*La culture du cotonier. Paris: J. André, 1901, pp. 375*).—A general treatise on cotton culture dealing largely with the industry in America and India. In addition to the culture of cotton, ginning, baling, insect enemies, diseases, and the value of cotton seed for feeding purposes are discussed.

The cowpea (*Southern Pines: North Carolina State Hort. Soc., [1902], pp. 63, figs. 12*).—A pamphlet treating of the origin, history, culture, and uses of the cowpea. The utilization of cowpeas for grazing, soiling, renovating, and fertilizing soils and for hay and silage is described.

Cowpeas, soy beans, and winter vetch, J. D. Towar (*Michigan Sta. Bul. 199, pp. 165–176*).—This bulletin gives a general description of cowpeas, soy beans, and winter vetch, together with directions for their culture and uses. The discussions consist largely of quotations from experiment station bulletins and from articles presenting the experience of practical farmers. The tabulated data given in the bulletin consist of analyses showing the percentage of digestible nutrients and fertilizing elements of feeding materials, including the crops under discussion, analyses of the soy bean made at the station, and the yield and composition of hairy vetch cut on different dates republished from a bulletin of the Alabama Station (E. S. R., 11, p. 921).

Alfalfa, cowpeas, and crimson clover as factors in reducing feed bills, A. T. Neale (*Delaware Sta. Bul. 55, pp. 3–8; Rpt. 1901, pp. 8–13*).—A discussion on the relative quantities of protein produced by alfalfa, cowpeas, and crimson clover based on data obtained in different experiments is summarized as follows: "Maximum crops of alfalfa of average tests yield 1,230 lbs. of protein per acre, equivalent to the amount contained in approximately 1½ tons of cotton-seed meal. Maximum crops of cowpeas and maximum crops of crimson clover of average test contain each not more than 725 lbs. of protein per acre. But a crop of clover and one of peas may be grown and made into hay annually from one and the same acre of land. Hence where alfalfa fails to thrive, peas and clover may be found to be a profitable substitute."

A critical study of Getty's method of raising cowpeas for silage purposes, A. T. Neale (*Delaware Sta. Bul. 55, pp. 8–23; Rpt. 1901, pp. 13–28*).—This method consists in growing corn and cowpeas together and ensiling the combined crop. The advantages of the method are enumerated and discussed. The results of testing the method are summarized as follows: "The total crop per acre was very slightly influenced by the seeding of peas with corn, but the quality of the crop, from the protein standpoint, was improved thereby to the extent of 25 per cent. With the exception of the cost of the pea seed and the expense of labor in the seeding, the mixed crop of corn and peas can be worked and harvested at the cost entailed by the corn alone. The density of the silage is so modified by the peas that in comparison with corn alone an increase in capacity of from 35 to 40 per cent may be credited to a silo when filled with the mixed crop." The cost per ton of material in the silos amounted to $1.46. The method was also tested by a number of farmers and desirable results were obtained. No serious difficulties were encountered in harvesting the crops by means of corn harvesters or in the use of silage cutters. The value of peas included in the crop per acre is estimated at $2.50 based on results obtained in the most favorable case at an outlay of 50 and 20 cts. per acre for seed and labor respectively.

The depth of plowing in flax culture, KUHNERT (*Mitt. Deut. Landw. Gesell., 17 (1902), No. 11, pp. 69–71*).—Cooperative tests were made to determine the effect of different depths of plowing on the growth of flax The land was plowed 12, 16, 20, and 24 cm. deep. The results for this experiment were in favor of plowing 16 and 20 cm. deep, but the author does not draw definite conclusions from this single test.

Hemp from the higher latitudes cultivated in France, E. GAIN (*Ann. Agron., 28 (1902), No. 2, pp. 103–110*).—Observations are reported on a comparison of Swedish and French hemp at Nancy. The seed of the Swedish hemp had been produced in Sweden at 63° north latitude, while the French hemp was originally from Piedmont, which is at 45° north latitude. The results of experiments carried on for three years show a constant proportion of 65 to 71 female plants to 100 male plants in the French hemp, while in the Swedish hemp the proportion of female to male plants was much larger, but decreased each year. The indications are that this decrease in the number of female plants is due to the change in climate and environment. The seed from the higher latitude produced precocious and rapidly developing plants, but rather light in weight. The author believes that by crossing the French with the Swedish hemp a variety ripening earlier, having a shorter period of growth, and producing a larger proportion of female plants may be obtained, but that by such a process the size of the variety might possibly be reduced.

Grasses and clovers in Idaho, H. T. FRENCH (*Idaho Sta. Bul. 33, pp. 87–107*).—This bulletin describes briefly the value of orchard grass, tall meadow oat grass, English rye grass, Italian rye grass, meadow fescue, Canadian blue grass, redtop, timothy, brome grass, alfalfa, and the most common species of clover, and gives directions for preparing the soil and seeding these different crops.

A number of field and plat experiments are reported. Two fields of about 6 acres each and each seeded down with a mixture of 40 lbs. of common red clover, 6 lbs. of alsike clover, 25 lbs. of orchard grass, 6 lbs. of meadow fescue, 5 lbs. of English rye grass, 10 lbs. of timothy, and 4 lbs. of tall meadow oat grass at the rate of 16 lbs. per acre gave good yields of hay and pasturage. A plat each of orchard grass, tall meadow oat grass, meadow fescue, English rye grass and brome grass sown at the rate of 20 lbs. per acre produced a good stand the first season and withstood the winter perfectly. Sheep were pastured on part of these plats to determine what grasses would be eaten first and how they would recover from close cropping. The grasses were eaten in the following order: Orchard grass, meadow fescue, brome grass, rye grass, tall meadow oat grass. Orchard grass was the first to start a new growth, followed by oat grass, meadow fescue, brome grass, and English rye grass in the order given. The hay harvested on the remainder of these plats showed that orchard grass and meadow fescue yielded 5,280 lbs.

per acre, tall meadow oat grass, 5,760 lbs., brome grass, 5,600 lbs., and English rye grass, 4,000 lbs.

Vermont grasses and clovers, L. R. JONES (*Vermont Sta. Bul. 94, pp. 139–184, figs. 32*).—A general description is given of grasses and grass-like plants, together with economic notes on a number of species occurring in Vermont. The relative value of hay, pasture, and lawn grasses of the different species is discussed, and the clovers and their allied plants are treated in a similar manner. Directions are given for the cultivation of the grasses and clovers, and a chapter is devoted to the impurities which are found in grass and clover seeds.

Economic notes on some of the grasses of southwest Missouri, S. A. HOOVER (*Missouri State Bd. Agr. Rpt. 1902, pp. 449–456*).—The results of a study of grasses and forage plants in four counties in the southwest part of the State are given. A number of cultivated and wild grasses are described and their relative value for hay and pasture indicated.

Kentucky forage plants, H. GARMAN and A. M. PETER (*Kentucky Sta. Bul. 98, pp. 61, pls. 16*).—In addition to other matter this bulletin discusses the appropriation of free nitrogen by leguminous plants, together with methods of soil inoculation. A list of Kentucky Leguminosæ is given with brief descriptive notes, but the most important ones, including the soy bean, alfalfa, sainfoin, velvet bean, serradella, cowpea, and the principal species of clover are considered more in detail. Notes on 11 varieties of cowpeas grown on plats at the station in 1901 are presented. In addition the results of plat experiments with 22 species of grasses in 1900–1901 are briefly given. The results of an experiment with blue grass seed gathered on different dates indicated that this seed should be harvested from about June 12 to June 20. One hundred and eight analyses of forage plants from the plat experiments are reported in a table.

Kentucky blue grass seed, A. J. PIETERS and E. BROWN (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 19, pp. 19, pls. 6, figs. 3*).—This bulletin describes the production of Kentucky blue-grass seed and gives an account of methods of harvesting, curing, and cleaning the same. The industry is confined to areas in Kentucky where much the greater portion is produced and to localities in southern Iowa and northern Missouri.

A study of the effect of curing on the vitality of the seed was made and the results of germination tests of samples of seed taken at different stages of the curing process are reported. The following conclusions are drawn from the results: "Green seed of Kentucky blue grass when put in ricks will ferment and reach a temperature of 130 to 140° F. in less than 16 hours. A temperature of 130 to 140° F. for 16 hours or less will greatly damage if not entirely destroy the vitality of the seed. Under the present methods of handling green seed it must be stirred at short intervals. The seed must not be stripped until mature, as it is much harder to prevent fermentation in the immature seed. Seed should always be put in small ricks, not over 18 in. high. Seed can be cured to better advantage under cover in bad weather and outdoors in clear weather." The authors believe artificial curing feasible and recommend that tests be made to demonstrate the practicability of this method.

The use of corn fertilizers on meadows, E. ZACHAREWICZ (*Prog. Agr. et Vit. (Éd. L'Est), 23 (1902), Nos. 2, pp. 40–46; 3, pp. 83–88*).—The subject of fertilizing meadows is considered at some length and the results of cooperative experiments in this connection are reported. It was found that commercial fertilizers were more profitably used on meadows than barnyard manure. Fertilizer formulas for different kinds of meadows are given.

The time of applying potash salts on moorland meadows, B. TACKE (*Landw. Wchnbl. Schleswig-Holstein, 52 (1902), No. 5, pp. 69–71*).—The experiments here described led to the conclusion that when there is danger of flooding, potash salts should be applied when vegetation is dormant and not too short a time before it begins to grow. This practice has not affected the stand of grasses unfavorably.

Experiments with oats, J. N. Harper and A. M. Peter (*Kentucky Sta. Bul. 99, pp. 65-78*).—The results of a test with 27 varieties of oats in 1901 are given in a table. The yields of grain and straw are reported and the color of the grain, character of the straw, and date of ripening are given. The yields of grain and straw for 4 successive years and the weight per measured bushel for 3 successive years are also shown for the different varieties. In 1901 the yields of the varieties ranged from 29.4 to 49 bu. of grain per acre, the leading varieties being White Russian, Improved Welcome, Negro Wonder, White Belgian, and New American, in the order given. The average weight per measured bushel for 3 years was 32.5, 31.1, 30.8, and 30.3 lbs. for Pringle Progress, Probsteir, Hopetown, and Imported Welcome, respectively. All other varieties gave an average weight of less than 30 lbs. per bushel.

The results of a fertilizer test with 160 lbs. per acre of nitrate of soda and muriate of potash applied separately showed a material increase in yield.

Analyses of the different varieties made to determine their relative value for feeding are tabulated. The average yield of protein was 293 lbs. per acre and the average percentage 6.77. Basing the selection on the production, varieties yielding 300 lbs. or more of protein per acre and having a protein content of over 7 per cent in the dry matter are the best for feeding purposes. Analyses of samples of all the varieties cut on July 5, 6, 7, and 8 indicate that the crops harvested on July 5 would have been slightly richer in protein, but would have given a smaller total yield. In general, the percentage of protein in the dry matter decreased and the quantity of dry matter increased as the plants reached maturity. The difference in composition of young and ripe oat plants is shown by analyses of samples taken June 16 and July 19.

Directions for the treatment of seed oats against smut are given and the meteorological conditions for 1898–1901, inclusive, are summarized in tables.

Fertilizers for oats, L. Grandeau (*Jour. Agr. Prat., n. ser., 3* (*1902*), *No. 6, pp. 177, 178*).—This article discusses the use of fertilizers for oats on poor soils. Several fertilizer applications to suit various conditions are recommended.

Plant breeding, M. Fisher (*Fühling's Landw. Ztg., 51* (*1902*), *No. 2, pp. 411-415*).—The results of experiments in breeding winter oats are reviewed.

Variety and fertilizer tests with potatoes, W. J. Green and C. W. Waid (*Ohio Sta. Bul. 133, pp. 71–87*).—Similar work has been previously reported (E. S. R., 11, p. 42). The yields of 55 varieties tested in 1901, together with the average yields of varieties grown for 3 and 5 years, are tabulated. Each variety tested in 1901 is described. The following varieties, in the order named, were most productive in 1901: Northern Beauty, Quick Crop, Maule Early Thoroughbred, Early Norwood, Early Fortune, Pingree, Roberts, Early Rose, and Pat Choice. Among the varieties tested for 3 years, Vigorosa, Maule Early Thoroughbred, Early Rose, Whiton White Mammoth, Livingston, Sir Walter Raleigh, Sir William, Uncle Sam, Pat Choice, and Pingree produced the best yields, while of those grown for 5 years, Enormous, Livingston, Early Trumbull, Uncle Sam, Sir William, Sir Walter Raleigh, Bovee, Maule Early Thoroughbred, Suffolk Beauty, and Carman No. 3 were the leading ones in point of production. Early Trumbull, Early Thoroughbred, Bovee, Early Harvest, and Early Ohio are recommended as early market varieties, and Livingston, Whiton White Mammoth, Enormous, Sir Walter Raleigh, and Carman No. 3 as late market varieties. Early Trumbull, Early Harvest, Livingston, Pat Choice, and Uncle Sam are considered especially adapted for home use.

The results of the fertilizer test show that superphosphate alone was much more profitable than either nitrate of soda or muriate of potash used singly. The most profitable application in this test consisted of 160 lbs. superphosphate and 80 lbs. nitrate of soda. All the applications tested proved profitable, with the exception of

480 lbs. superphosphate, 300 lbs. muriate of potash, and 320 lbs. of nitrate of soda per acre.

Variety tests of potatoes, E. Gross (*Fühling's Landw. Ztg., 51 (1902), No. 4, pp. 121-123*).—This article summarizes the results of variety tests with potatoes, which were carried on for 3 years. The varieties under test were originated by a seed firm in Galicia. A number of these varieties gave good results under rather unfavorable climate and soil conditions. For moist soils the varieties Skarbek, Dolega, Perkun, and Kmit are recommended.

Potato experiments at Garforth, R. S. Seton (*Yorkshire Col., Leeds, and East and West Ridings Joint Agr. Council, Pamphlet 21, 1902, pp. 7*).—In a test of 9 varieties of potatoes, British Queen gave the best yields in 1900 and 1901, and produced tubers of better quality than any other variety. Cut sets for seed gave better yields than whole tubers. Tubers greened in the fall by exposing them to sunlight produced a larger yield than ungreened seed. Planting in rows 28 in. apart and placing the sets about 15 in. apart in the row is recommended.

Sand lucern, J. D. Towar (*Michigan Sta. Bul. 198, pp. 147-160*).—This bulletin gives a description and the botanical history of sand lucern (*Medicago media*), with directions for its culture and uses. The results of a number of experiments conducted at other stations and showing the value of alfalfa for feeding and soil renovation are reviewed, and the experiences of Michigan farmers with sand lucern are reported.

Culture experiments with this plant have been in progress at the station since 1897. A sixth-acre plat yielded at the rate of 6,800 lbs. of cured hay per acre in 1898, 10,580 lbs. in 1899, 12,310 lbs. in 1900, and 13,839 lbs. in 1901. In 1898 three cuttings were made, while in the succeeding years four crops were obtained each season. The dates of cutting averaged about June 10, July 12, August 15, and October 1.

An analysis of the hay made in 1901 is reported in a table. The crop produced per acre 1,529 lbs. of digestible protein, 4,307 lbs. of digestible carbohydrates, and 140 lbs. of digestible fat, as calculated with the coefficients of digestibility for alfalfa. As to the fertilizing value of the hay, the crop contained 330 lbs. of nitrogen, 62 lbs. of phosphoric acid, and 426 lbs. of potash per acre. For green forage, hay, and pasture sand lucern is considered equal to common alfalfa. As a cover crop in orchards it is said to rob the trees of plant food and moisture.

Sorghum in 1901, C. L. Penny (*Delaware Sta. Rpt. 1901, pp. 74-76*).—Analyses of the sorghum crop for 1901 made on different dates from October 8 to November 20 are given in a table, together with analyses of the crops grown during the last four seasons. The crop of 1901 showed the highest percentage of sugar in the juice except that of 1898, and gave a larger yield of cane, of total sugar per acre, and of available sugar per acre than any other crop except that of 1900. The purity of this season's crop was the lowest of all.

Beets and sorghum compared on the basis of sugar production, A. T. Neale (*Delaware Sta. Rpt. 1901, pp. 32-35*).—The comparison of sugar beets and sorghum was made on 2 plats, one-half of each being devoted to sugar beets and the other half to sorghum. The season was favorable to sorghum but unfavorable to beets. The average yield of total sugar in the sorghum was 5,653 lbs. per acre, and in the sugar beets, 1,045 lbs. It was observed that cane still standing November 20 had deteriorated by apparently 1,000 lbs. of sugar per acre, and since the specific gravity of the juice was practically as high as it was on October 8, it is concluded that the test was lowered by the presence of inverted sugar in canes which had been mutilated by windstorms. Sugar beets dug on December 2 were still in good condition, indicating that the working season for sugar beets is longer than the season for sorghum. Owing to the use of modern machinery, sorghum culture is considered as being placed upon a practical basis.

The sugar beet in Delaware, A. T. Neale (*Delaware Sta. Rpt. 1901, pp. 30-32*).—

An account is given of experiments in sugar-beet culture undertaken by the station. The results were not quite satisfactory and no conclusions are drawn.

Sugar-beet experiments, C. L. PENNY (*Delaware Sta. Rpt. 1901, pp. 76, 77*).—This year experiments in growing sugar beets were undertaken by the station for the first time. Sample beets to the number of 393 were produced by 29 growers. The results with reference to the weight of the sample beets, their sugar content and purity are tabulated and briefly discussed. Owing to inadequate attention given to the crop the results are not considered decisive.

Sugar-beet experiments in 1901, J. D. TOWAR (*Michigan Sta. Bul. 197, pp. 117–144, figs. 6*).—In a test of 8 varieties, Austrian B. A. produced the highest value of crop per acre, amounting to $59.69. This same variety showed a sugar content of 13.51 per cent in the beet, being the highest in the test. The average sugar content of all varieties was 11.91 per cent and the purity 79.8 per cent. A seed test to determine the number of sprouts from 100 seed balls was made in connection with this experiment, and the results are reported.

A report is given on an experiment carried on for three successive years with beets planted on different dates. Planting on May 8 gave the highest yield of sugar, and the yields decreased as the planting departed from this date, although there was but little difference in the results from planting on May 8 and May 1. The author believes that the time of profitable planting is not very limited, and that planting may be done as early as the middle of April if the ground can be properly prepared. Planting after May 20 gave decided decreases in the results. In some cases early planted beets were attacked by leaf blight which lowered the sugar content, while varieties planted later thus escaping the disease and growing continuously throughout the season gave better returns. Early planting gave no indication of early maturity.

A distance of 18 in. between rows gave better results than 21 or 24 in. The value of crop per acre from the 21-in. rows was only $2.21 less, and owing to the greater facility in cultivating wide rows, the author considers 21 in. a favorable distance.

The results for three seasons, and their averages, obtained in experiments with maximum, minimum, and normal amounts of several fertilizing elements are reported in a table and briefly discussed. The normal application consisting of 200 lbs. each of nitrate of soda and muriate of potash and 400 lbs. of dissolved phosphate rock per acre, gave nearly as good average results as an application containing 800 lbs. of dissolved phosphate rock. As a rule, double applications of the different elements gave no appreciable gains over the normal application, and omitting an element entirely resulted either in a small crop of beets or a low sugar content. The results of another test with excessive amounts of fertilizing elements in addition to the normal fertilizers were in favor of increasing the nitrogen, the yield being greater and the percentage of sugar higher. The general results favored nitrate nitrogen as compared with ammonia nitrogen. In a soil test the average increase in yield from nitrate nitrogen over organic nitrogen was 18 per cent, and the average quantity of sugar produced for three years in a special comparative test was 2,394 lbs. per acre for nitrate nitrogen and 2,154 lbs. for ammoniacal nitrogen. "The general conclusion [from soil test experiments with fertilizers] is that for the best results no single element or 2-element fertilizer will do as well as our complete fertilizers, and that stable manure increases the tonnage but does not increase the total number of pounds of sugar in a similar proportion." In another comparison of barnyard manure with other fertilizers the manure produced the lowest average percentage of sugar, although the tonnage was nearly the highest.

The exhaustive effects of the sugar-beet crop were observed by comparing results obtained on fertilized and unfertilized plats. The decrease in yield on the unfertilized plats as compared with plats receiving annually a normal application of fertilizers was 1.25 per cent the first year, 11.25 per cent the second year, and 13.85 per cent the third.

Results of analyses of sugar beets from plantings made weekly from April 13 to June 5, inclusive, and sampled on alternate days from September 11 to November 16, together with weekly averages of the same, are shown in a table. In these tests it was observed that heavy rains and cloudy weather from October 14 to 25, lowered the sugar content. Beets sampled the first week in November showed the highest percentage of sugar.

Beets stored in piles in the field with sufficient protection to prevent freezing weighed 5,345 lbs. October 26, 4,655 lbs. November 27, and 4,478 lbs. December 31, the total loss in weight amounting to 16.22 per cent. All varieties stored in this way September 1 showed a gain in the percentage of sugar, the average increase for the different varieties being 6 per cent. The loss in weight was not commensurate with the gain in the percentage of sugar, for during the first month of storing there was an actual increase of 82⅓ lbs. of sugar or practically 14 per cent, while during the second month the decrease in the sugar content was so great that the beets at the end of the period showed a loss of 9.37 per cent. The average coefficient of purity for the different varieties was 78 October 26, 80 November 27, and 72 at the close of the experiment.

Sugar-beet seed 1, 2, 3, and 4 years old showed practically no difference in vitality, indicating that the seed is not injured when kept under favorable conditions. Soaking the seed was of no advantage and proved an inconvenience in sowing with the drill. A test of home-grown seed demonstrated the possibility of growing sugar-beet seed in that locality. Beets from seed accidentally sown in the fall gave promising results and led to further experiments along that line. Imported seed gave better results both as to sugar content and purity than commercial seed obtained from a seedsman.

The leaf curl of beets is discussed and several tests of diseased beets reported. The sugar content in the beets affected with leaf curl ranged from 5 to 7½ per cent. In studying the influence of the size of beets on the sugar content, it was found that in every case except one the percentage of sugar in each variety increased as the size decreased. The average difference between 32 oz. and 8 oz. beets was 2 per cent and the 16 oz. beets were nearly ⅔ per cent richer than the 32 oz. beets.

The influence of lack of plant food on the sugar beet (*Deut. Landw. Presse, 29* (*1902*), *No. 11, p. 84*).—A summary of results is given. It is shown that an insufficient potash supply decreases the sugar content and when a large quantity of nitrogen is present the percentage of sugar in the beet sometimes drops to below 1 per cent and the beet itself has a tendency to become diseased. A small nitrogen supply under these same conditions produces a much richer and healthier beet. In connection with a lack of phosphoric acid the effect of nitrogen is not so marked. Lack of potash increases leaf growth. A subnormal quantity of phosphoric acid produces a perfectly healthy beet with a fair sugar content and a subnormal nitrogen supply produces a healthy beet with a very high percentage of sugar.

Green manuring for sugar beets, H. BRIEM (*Bl. Zuckerrübenbau, 8* (*1901*), *Nos. 9, pp. 133–139; 10, pp. 155–159; 11, pp. 165–168*).—A general discussion of the subject in which the results of experiments in this connection are reviewed.

The history of sugar-beet culture and beet-sugar manufacture with legislation affecting the industry in France during the nineteenth century, J. HELOT (*La sucre de betterave en France de 1800 à 1900; culture de la betterave, législation, technologie. Cambrai: Fernand and Paul Deligne, 1900, pp. 220, pls. 15*).

Experiments in cultivating sugar cane, W. C. STUBBS (*Louisiana Stas. Bul. 66, 2. ser., pp. 780–802*).—This bulletin presents a short treatise upon the principles involved in the preparation and cultivation of the soil, and reports the results of experiments in cultivating sugar cane carried on during the past few years. Previous work in this line has been reported in a former bulletin (E. S. R., 12, p. 438).

In these experiments cultivation was performed with the plow alone, the plow supplemented by the disk and middle cultivator, and the cultivator without the use of the plow. The aggregate yields of sugar cane for four years in five different systems of cultivation are reported, and it is shown that the use of the plow alone gave the smallest tonnage of cane. The best yield was obtained from the use of the disk and middle cultivators alone. These implements can be adjusted to make small or large ridges and the depth can be regulated so that only a minimum amount of roots are cut in cultivating. This method was found to conserve moisture and to increase microbic action, greater numbers of microbes being found in a soil finely pulverized by the cultivators than in a cloddy soil worked with the plow.

Fertilizing experiments with sugar cane, J. D. Kobus (*Meded. Proefstat. Oost-Java, 3. ser., 1901, No. 31, pp. 25*).—The purpose of this series of tests was to determine whether three successive crops of sugar cane can be economically taken from the same soil and in what fertilizing elements the soil was deficient. The cane was grown in 60 large boxes containing soil which had already produced two crops. These boxes were divided into 5 series of 12 each. The first was a check series and received no fertilizers; the second received sulphate of ammonia, and the third, phosphatic slag; the next, sulphate of potash; and the last, sulphate of potash and phosphatic slag. In addition to these fertilizers, the last three series received sulphate of ammonia. As compared with the check test, sulphate of ammonia increased the yield by 53 per cent, showing that the soil was deficient in nitrogen. The lack of phosphoric acid was even more apparent, since the plants receiving both these fertilizers yielded 20 per cent more than the plants receiving only the sulphate of ammonia. The addition of lime proved injurious, especially when applied in connection with phosphoric acid, in which case it reduced the yield and the sugar content.

Chemical analyses of the cane revealed no material difference in the composition due to the fertilizers applied. The plants which received sulphate of ammonia contained more potash and sulphur and less phosphoric acid than the check plants. Lime, although it affected the yield, did not change the composition.

The following season showed that the application of nitrates generally increased the yield, while the use of lime was injurious to the yield and the quality of the juice. The unfertilized plants produced a juice of superior quality. The chemical analyses of the plants grown the second year indicated that the fertilizers had no effect on composition. However, the plants which did not receive sulphate of ammonia were poorer in nitrogen, potash, sulphur, and lime, and richer in phosphoric acid than those receiving different treatment.—H. M. PIETERS.

New method of preserving sweet potatoes, J. S. Newman and J. S. Pickett (*South Carolina Sta. Bul. 71, pp. 6*).—This method consists essentially in boiling the sweet potatoes before evaporating them. Tests were made with a number of varieties, and the results are shown in the following table:

Yield of sweet potatoes and evaporated product.

Varieties.	Yield per acre.		Evaporated product.	Yield per acre of the evaporated product.
	Bushels.	*Pounds.*	*Per cent.*	*Pounds.*
Pumpkin Yam	232	13,920	24	3,340
Hanover Yam	329	19,740	26	5,132
Extra Early Caroline	146	8,760	25	2,190
Red Nose	238	14,280	24	3,427
Nansemond	222	13,320	22	2,930
Bunch Yam	165	9,900	18	1,782
Georgia Sugar Yam	211	12,660	23	2,911
Vineland Bunch Yam	136	8,160	22	1,795
Jersey Big Stem	357	21,420	29.5	6,318
Pierson Yam	328	19,680	22	4,329
Jersey Red	261	15,660	29	4,542

The evaporated product "will keep for an indefinite time and bear transportation to any part of the world at any season." An analysis of air-dry evaporated sweet potato gave the following results: Moisture 3.42 per cent, crude ash 2.48 per cent, crude protein 5.06 per cent, crude fat 0.80 per cent, crude fiber 2.08 per cent, nitrogen-free extract 86.16 per cent. It was observed that all varieties showed losses from rotting when stored from November until March.

Tobacco culture on the east coast of Sumatra, W. WESTERMAN (*De tabakscultuur op Sumatra's oostkust. Amsterdam: J. H. de Busey, 1901, pp. 300, pls. 30, figs. 10, map 1, dgms. 14*).—An extensive treatise on the culture of tobacco on the east coast of Sumatra, including a description of its preparation for market, and a consideration of labor, commerce, and other economic phases of the industry.

Sumatra tobacco, H. DENTZ (*Sumatra Tabak. Amsterdam* [*1901*], *vol. 7, pp. 70 + XV*).—Notes on the commerce of Sumatra tobacco, with ratings of different companies trading in the product.

Fertilizers for tobacco, P. WAGNER (*Mitt. Deut. Landw. Gesell., 17* (*1902*), *No. 14, pp. 81–84*).—The subject of fertilizing soil in tobacco culture is considered and a number of different methods to suit certain conditions are suggested. According to the author tobacco should be grown on soil rich in potash, and fertilizing substances containing chlorin should not be used. The dry substance of the leaves should not contain more than 0.6 per cent of chlorin and not less than 6 per cent of potash.

The soverane herbe; a history of tobacco, W. A. PENN (*London: Grant Richards; New York: E. P. Dutton & Co., 1901, pp. 326, pls. 5*).—A history of tobacco, including its cultivation and manufacture, the making of pipes, the use of cigars and cigarettes, and statistics on the consumption of tobacco since its use has become common.

HORTICULTURE.

Field experiments with nitrate of soda on market garden crops, E. B. VOORHEES (*New Jersey Stas. Bul. 157, pp. 20, pls. 2*).—The author made a study of the effect of different quantities of nitrate of soda for carrots, cabbage, celery, tomatoes, peppers, turnips, and sweet corn, and of the relative advantages of two and three applications. In all cases the plats were first liberally fertilized with acid phosphate and muriate of potash. The data as to the yields obtained with the different crops are tabulated and the proportion of primes and culls shown in each instance.

Carrots.—Applications of 300 and 400 lbs. per acre, respectively, of nitrate of soda were applied to carrots cultivated in different plats. With this crop the increased yield obtained was only just about sufficient to pay for the increased cost of the fertilizers used. This result was thought to be due to some untoward condition of the season.

Cabbage.—When 400 lbs. of nitrate of soda per acre, applied in three different applications, was used the gain in the total yield was 13,810 lbs. or 156 per cent. On the other plats where only 300 lbs. of nitrate of soda was used, or only two applications made, the increase while very large was in no case in excess of 100 per cent. The average gain for all the plats by the use of nitrate of soda was 1,287 heads. When 400 lbs. of nitrate of soda per acre was used there was a gain of 1,450 heads, and when 300 lbs. was used there was a gain of 1,125 heads. The larger application resulted in the more satisfactory yield, though the plants did not economically use the larger amounts applied. When two applications were made there was a gain of 945 heads per acre; when three were made there was a gain of 1,630 heads, thus making the increase 685 heads per acre due to the third application. The three applications were more effective than the addition of 100 lbs. of nitrate of soda. The most profitable crop was obtained by the use of 400 lbs. of nitrate of soda applied in three equal dressings, since the heads in this crop were much firmer and sold for 50 per cent more than the heads grown on the other plats.

Celery.—The total additional yield of celery due to the use of nitrate of soda was 17,810 lbs., or 132 per cent. The value of the crop when the nitrate of soda was used averaged $378.10 per acre, at a cost of but $7 for fertilizers. This was $54.01 gain for each dollar invested in nitrate of soda. The amount of nitrate of soda used was 300 and 400 lbs. per acre, respectively. When these amounts were given in two equal applications the average yield obtained was 14,500 roots, and from three applications 14,995 roots, or a gain of 495 roots, worth $31.19, for the third application. The gain from the third application was considerably larger when the 400 lbs. was used per acre than when the 300 lbs. was used.

Tomatoes.—Owing to an unfavorable season there was an imperfect setting of this fruit. The amount of nitrate of soda applied varied from 200 to 300 lbs. The increase in yield obtained from the different plats varied from 3,220 lbs., when the nitrate of soda was applied in two equal applications at the rate of 200 lbs. per acre, to 5,880 lbs., when the same amount of fertilizer was applied in three equal distributions. The average gain for all plats where the nitrate of soda was used was 4,564 lbs., or 62 per cent. There was a gain on the average of 475 lbs. of fruit when 200 lbs. of nitrate of soda was used over the yield obtained when 300 lbs. was used. The third application tended to produce a larger growth of vine and later maturing fruit, and this materially reduced the yield.

Turnips.—The use of nitrate of soda with turnips increased the yield, on the average, 5,230 lbs., or 63.3 per cent. There was an increase of 2,960 lbs., or about 20 bbls. per acre, when nitrate of soda was used at the rate of 300 lbs. per acre, over the yield obtained when only 200 lbs. per acre was used. With this crop two dressings, whether of the larger or smaller amount, were much more effective than three dressings. The third dressing seemed to increase growth of top rather than root, and thus decreased the yields. The increased value of the crop, due to the use of nitrate of soda when 300 lbs. was used in two equal applications, was $38.85 per acre.

Peppers.—The use of nitrate of soda considerably increased the yields in every instance with this crop. When 200 lbs. was applied per acre in two equal dressings the increased cash value of the crop due to the use of the nitrate was $16.70. When this same amount was applied in three equal dressings the increased value of the crop was $25.90. When 300 lbs. of nitrate of soda was used in two applications the increased value of the crop was $30.20, and in three applications $29.50.

Sweet corn.—Earlier experiments at the station have shown that this crop responds better to applications of nitrogen in ammonia or some organic form than in nitrate of soda. There was a considerable gain, however, in the yield and value of the crop from all the different plats where nitrate of soda was used. The most profitable gains were made when 300 lbs. of nitrate of soda was used in three different applications. The gain in the value of the crop in this instance over the plat where no fertilizer was used was $18.10.

Conclusions.—The results of the season's work with nitrate of soda, in the author's opinion, justify the following conclusions:

"That both the yield and quality of vegetable crops are improved by a liberal supply of available nitrogen. That large quantities of nitrogen (300 to 400 lbs. of nitrate of soda per acre) are, on the whole, preferable to smaller quantities. That where large quantities of nitrate of soda are used fractional dressings are likely to result in a greater proportionate use of the nitrogen. Three dressings proved, on the whole, more profitable than two. When the growth is satisfactory the third dressing may be withheld."

Home-grown v. purchased seed, W. C. Stubbs, F. H. Burnette, and E. Watson (*Louisiana Stas. Bul. 68, 2. ser., pp. 820-846*).—The author states that there is a general belief that southern-grown seed is inferior to more northern seed. Experiments have therefore been undertaken at the station and substations to determine the truth of the matter. Tests have been conducted now for four years with a large number of vegetables, which show that, in the main, nearly all varieties of home-grown vegetable seed are equal, and in some instances superior, to northern-grown seed. Difficulties were sometimes encountered in properly curing the home-grown seed, owing to the dampness of the climate, inexperience, weevils, etc. The following crops gave as good results with home-grown seed as with northern-grown, and in some instances better: Bush beans, Lima beans, pole beans, garden beets, cauliflowers, carrots, cucumbers, eggplants, sweet corn, endive, lettuce, muskmelons, watermelons, mustard, okra, onions, peppers, potatoes, sweet potatoes, tomatoes, radishes, spinach, squashes, pumpkins, and turnips. No success has been attained in raising home-grown cabbage seed.

Tests of varieties of vegetables were made at the same time. In addition to tests of the vegetables mentioned above, the following were grown: Artichokes, asparagus, Brussels sprouts, broccoli, kale, kohl-rabi, leeks, shallots, parsley, Chinese cabbage, and a large number of Japanese vegetables, obtained from the U. S. Department of Agriculture.

Tests were also made of the following varieties of fruits: Apples, pears, peaches, plums, figs, oranges, mulberries, raspberries, blackberries, dewberries, strawberries, goumi, and jujube. Of the 45 varieties of apples grown, Rhodes Orange Moultrie, Killagiskie, Yates, Shockley, and Pear or Palmer bore large crops that kept well. At Audubon Park sand pears were the only ones that succeeded. At Baton Rouge 46 varieties were grown, of which the Le Conte bore a large crop. From present experience it is not possible to recommend the most suitable varieties of pears for Louisiana. Peaches were not a success at Audubon Park. The Peento type have been destroyed by frost each year at Baton Rouge, and have therefore been discarded. Of the other varieties grown, Elberta has proven the most productive. Some of the varieties recommended for culture at Calhoun are Triumph, Champion, Smock, Crosby, Troth Early, Austen Late, etc. Plum growing has not been a success at any of the stations. The goumi bushes planted at the stations bear enormous crops of fruit each year. They also rank high as an ornamental shrub. The jujube produced its first crop of fruit in 1899 and is still growing well.

Preliminary account of variation in bean hybrids, R. A. Emerson (*Nebraska Sta. Rpt. 1901, pp. 30-49, pls. 3*).—An account is given of the variation occurring in hybrids and their progeny of a number of races of kidney beans (*Phaseolus vulgaris*). The work was begun in 1898, and in some cases has been carried through five generations. Combinations have been made between varieties with yellow, green, and blue-green pods; stringy and stringless pods; long and short pods; round and flat pods; white, red, brown, black, and variously mottled seeds; oblong and nearly round seeds, etc. The method of work observed is given in detail. The hybrid seed used for planting in the field was grown in a greenhouse, since the climate of the station does not permit a successful outdoor hybridization of this crop. Kidney beans are perfectly self-fertile, and in the author's observations only 4 per cent of hybrid forms were found in lots of bean plants the preceding generation of which was grown in a field with over 100 races, the most of which were in blossom at the same time.

In the author's experience all the racial hybrids of beans produced showed little variation in the first generation, but pronounced variation in the second and third generations. They appeared fairly well fixed in the fourth and fifth generations.

The characters of the two parents were usually reproduced in the hybrids, though occasionally new or atavistic tendencies were notable. Characters differentiating the parent forms were usually blended together in the hybrids, or united unchanged in mosaics of small or large pattern. Of the blends, Blue Pod X Davis is cited. The brown color of the seeds of Blue Pod united with the white color of the Davis seed, to form light brown seeds. Golden Wax, a nearly stringless podded sort, united with the Mohawk, a stringy podded variety, to produce a hybrid with pods less stringy than Mohawk and more stringy than Golden Wax. The ratio of the length to the thickness of seed of Stringless Green was found to be about 2.21, and of Warwick, 1.92. In the hybrid Stringless Green X Warwick, the ratio was 2.11. A number of other examples of blends are cited.

Mosaics were obtained when the white-seeded Davis was crossed with the red-seeded Scarlet Flageolet, the hybrid seed being spotted red and white. A like mixture of colors occurred in hybrids of Currie X Golden Wax and Wardwell X Challenge Black, etc. Cases are also cited in which hybrid seeds took all their characters, such as color, shape, size, etc., from one parent, while the characteristics of the pods, such as color, shape, stringiness, etc., were taken from the other. Keeney X Davis is cited as an example of this kind. This hybrid had white seeds like the Davis and pods like the Keeney. Sometimes the characters of one parent were found mixed with the blended characters of the two parents. Thus some individuals of the third generation hybrid Blue Pod X Davis had leaves and stems like the Davis, brown seeds like Blue Pod, and flowers in which the dark bluish purple of the Blue Pod was plainly diluted by the white color of the Davis. Instances are cited in which hybrids could not be differentiated from one of the parents. Thus, "In second and third generation hybrids of Blue Pod X Davis numerous individuals were so nearly like Blue Pod that they could scarcely be distinguished from those races by any characters of plant, pod, flower, or seed. The considerable number of reversions in this case is specially noteworthy because of the fact that the two parent races differ in nearly all their characters."

Those characters which were transmitted entire or almost unchanged in first generation forms, and termed "dominant" by Mendel (E. S. R., 13, p. 744), were found, as in Mendel's experiments with beans, to be green-colored pods and a long plant axis. Other characters which tended to impress themselves strongly in the first generation hybrids were dark seed colors and stringless pods. When green and yellow podded races were crossed, the first generation hybrids had green pods, yellow and intermediate colors not appearing until later generations. When semidwarfs and dwarfs were crossed, the first generation hybrids were all semidwarfs, strictly dwarfs not appearing until the second generation. Atavistic tendencies were found especially prominent in the pod colors whenever Davis or Mohawk was used as one of the parents. This fact suggests that these races probably came originally either directly or indirectly from such varieties as Horticultural, Goddard, etc.

Investigation as to the cause of pithiness in celery, E. P. Sandsten and T. H. White (*Maryland Sta. Bul. 83, pp. 110–119, figs. 5*).—In 1900 two samples of American and one of French celery seed were sown in similar seed beds and 200 plants from each seed bed selected for planting in an open field June 14. The plants in every case were given the same kind of cultivation and attention. When the celery was dug in December it was found that 40 per cent of the plants grown from American seed were pithy, while not a single stalk of the plants from the French seed was pithy. These results were so striking that the experiment was continued in 1901, seed being obtained from five different seed firms. The experiment that year divided itself into two phases, early transplanted and late transplanted. One hundred plants were used in each instance. The results obtained during the season are shown in the following table:

Pithy celery stalks from seed of different origin.

Kind of seed.	Pithy stalks.	
	Early transplanted.	Late transplanted.
	Per cent.	*Per cent.*
A's French-grown seed	1	00
A's American-grown seed	43	46
B's French-grown seed	38	26
B's American-grown seed	40	43
C's French-grown seed	00	00
C's American-grown seed	....	38
D's American-grown seed	31	....
D's Select American-grown seed	....	10
E's Selected XX	20	....

The author makes the following comments on these results: "The stalks from A's and C's French-grown seed were very uniform and alike in all particulars, and were evidently procured from the same source in France. B's French grown was in no way different from B's American grown. The stalks were not of uniform color or size. It was evidently a mixed lot, or else the seed plants had not been carefully selected and 'rogued.' The stalks from A's American grown, from B's American, from D's American grown, from E's Selected XX were of the same general character, both as to habit of growth and mixture of colors. The plants from the American-grown seeds were not uniform in their growth or in their color."

These experiments, taken as a whole, it is believed show the superiority of French-grown celery seed over American-grown seed. This superiority, however, is thought to be due more to the careful selection of seed by the French than by American seedsmen. With the same care in selection, American seed would probably be as good as foreign seed.

Detailed directions are included in the bulletin on celery culture in Maryland from the planting of the seed to the storing and marketing of the crop.

Experiments in hybridizing (*Indian Gard. and Plant., 10 (1902), No. 13, p. 218; abs. from Standard*).—It is stated that on Sutton's trial-seed grounds one plant each of Dwarf Green Curled kale, Brussels sprouts, broccoli, Red Variegated kale, Purple-colored kale, Thousand-colored kale, Portugal cabbage, Sutton Favorite cabbage, Dwarf Blood Red cabbage, and Drumhead Savoy were all planted in one bed together to see if they would cross. Plants grown from the resulting seeds showed remarkable variation, thus proving the necessity of keeping these plants separated in the seed grounds.

The book of vegetables, G. WYTHES (*London and New York: John Lane, 1902, pp. 106, figs. 17*).—This is the seventh of the series of handbooks of practical gardening edited by H. Roberts, and deals with the culture and varieties of vegetables grown in England, such as cabbage, broccoli, Brussels sprouts, spinach, various roots and tubers, onions, beans, etc. Chapters are also given on the history and cookery of vegetables, by the editor. Like many of the other books in the series, the directions regarding methods of culture, varieties, etc., are particularly adapted to English conditions, and hence will be found of but minor value to American gardeners.

The agave; memoir on its culture and the value of its products, J. C. SEGURA (*El maguey; memoria sobre el cultivo y beneficio de sus productos. Mexico: Mexican Agr. Soc., 1901, 4. ed., pp. 411, pls. 22*).—This is a manual of the agave and its various productions. It includes the history of the plant, botanical classification and descriptions of varieties, methods of nursery and field culture, insect enemies, methods of securing the juice, and the manufacture of pulque and mescal, with an account of the uses of those products as beverages and medicines. A bibliography of about 200 references is included in the work.

Report of the horticulturist, G. H. Powell (*Delaware Sta. Rpt. 1901, pp. 83–126, figs. 12*).—This report presents the results of the season's investigations with the Chinese Cling group of peaches (published as a bulletin, E. S. R., 13, p. 1049) and with the pollination of apples and pears. The studies with the latter fruits are in continuation of those reported last year (E. S. R., 13, p. 245). The work with apples during the season indicates that practically all the more important varieties grown on the Chesapeake Peninsula are probably self-sterile. July and Bough, both of little commercial importance, were the only varieties that set any considerable amount of fruit when self-pollinated. Astrachan, Early Harvest, and Yellow Transparent were more or less self-fertile and under favorable conditions might produce crops. The varieties that were found self-sterile, or nearly so, were Early Ripe, English Russett, Fanny, Gilpin, Gravenstein, Grimes, Lilly of Kent, Missouri Pippin, Nero, Paragon, Red Streak, Stark, Stayman, Strawberry, William Favorite, and Winesap. The self-fertile kinds were confined almost exclusively to summer sorts. Gilpin, a winter sort, set a few fruits, but they dropped as the season advanced. The season's work with apples strongly indicates the advisability of mixing varieties in commercial orchards.

Experiments in intercrossing varieties of apples indicate that Paragon, Stayman, Winesap, and Lilly of Kent, all weak pollen bearers except the latter, are intersterile and should not be planted together in commercial orchards for the purpose of cross-pollination.

In a study of the blooming period of varieties of apples it was found that good tillage, spraying, fertilizing, etc., extended the period of flower-bud formation in the fall and seemed to prolong the blossoming period in spring, while on poor, uncultivated soils the blooming period was shortened. Diagrams are given showing the blossoming period in 1901 of 9 varieties of apples grown at Denton, Md., 16 varieties at the station, and 32 varieties in Kent County, Del. Lists are also given of the varieties of apples introduced into Delaware by the station since 1897.

Further experiments with the Keiffer pear indicate that it is practically self-sterile in Delaware and that varieties used for pollination exert little if any influence on the size or appearance of the fruit.

The experiments of two years have shown "that the Keiffer is not more fertile with pollen from a distant orchard than with pollen from the tree on which the crosses were made; that the Keiffer may be somewhat more self-fertile in one orchard than in another; that a cross-fertilized pear starts into growth with more vigor and develops more rapidly than a self-fertilized one; that the crosses with different varieties do not show differences that can be attributed to the pollenizer. . . . Garber and Le Conte are the most satisfactory pollenizers [for Keiffer], though the characteristics of either one leave much to be desired. A pollenizer is needed with the quality of the Seckel and the vigor and prolificacy of the Keiffer."

The record of 1901 showed that if 2 blossoms of Keiffer out of 100 set fruit the resulting crop was a heavy one.

Experiments with deciduous fruits at and near the Southern Coast Range Substation, C. H. Shinn (*California Sta. Bul. 141, pp. 48, figs. 18*).—An account is given of the results secured in 13 years' experimental work with deciduous fruits at the Southern Coast Range Substation. The results secured are supplemented by concise accounts of the results secured by a large number of the most successful deciduous fruit growers in the vicinity of the station. The data obtained cover a territory of about 40 miles long by 20 wide. The substation work shows that in that climate successful culture of most deciduous fruits is impossible. It is practically useless to plant almonds, cherries, prunes, and apricots, except in a few sheltered spots on good, well-watered soil. The most successful fruits throughout the district have been pears and hardy American plums. On the better soils, free from hardpan, pears are likely to bear well 4 years out of 5, apples 3 years out of 5, and peaches and nectarines 2 years out of 5. Persian mulberries will bear nearly every year, and grapes yield fairly well 4 years out of 5. These figures are based on orchards given every attention as regards spraying, pruning, cultivation, etc. Pears are likely to come nearest to being profitable and are considered the safest fruit for the entire district. The general conclusion is reached that the growing of fruit, except in especially favored localities should be only a secondary resource in the region east of the Salinas. Large plantings and costly experiments should be avoided. Grapes may be grown with a little expense over a large area for the home table and wine use, but not for high-class raisins.

Thinning fruits, E. P. Sandsten (*Maryland Sta. Bul. 82, pp. 97–99*).—The purpose of this bulletin is to call the attention of the fruit growers of Maryland to the value of thinning orchard fruits. According to the author peaches and plums should be thinned after the "June drop," peaches to not less than 5 in. apart, and plums to from 2 to 3 in. apart. Apples and pears should be thinned when they have attained the size of small crab apples. Pears should be thinned to about 4 or 5 in. apart, and apples to the same distance as peaches. The advantages of thinning are more regular crops, stronger and more shapely trees, less disease, and larger, better colored, more uniformly ripened, and more salable fruit. Thinning, however, will not pay unless pruning, spraying, fertilizing, and cultivation have been properly attended to.

Improving an orchard, F. W. Card (*Rhode Island Sta. Bul. 83, pp. 143–152, figs. 8*).—This is a popular account of an attempt made by the station to bring up one of the worthless orchards in the vicinity of the station into a profitable bearing condition, by means of proper cultivation, spraying, pruning, fertilizing, etc. As a result of 3 years' work it has been quite definitely proven that neglected orchards can be easily brought into good bearing conditions by the methods above mentioned. The orchard under consideration contains only 0.86 of an acre. In 1901 only part of the trees were in bearing, yet about $80 worth of fruit was harvested. It is believed that few parts of the farm offer better chances for profitable returns than the orchard, when well managed.

The value of improved methods in the propagation of fruit trees, G. T. Powell (*Proc. New Jersey State Hort. Soc., 27 (1902), pp. 125–135, figs. 2*).—The author reports that he has successfully grown the King apple in New York by using the Northern Spy as a foundation stock. In this work choice buds, taken from trees that regularly produced an excellent quality of fruit, were used. No canker has appeared on these trees during the past 10 years, the trees have shown unusual thrift and vigor, and the fruit has been uniformly fine. In propagating peach trees selected buds have been taken from mature trees. Buds thus set in stock not over 20 in. in height and scarce half an inch in diameter have produced fruit within 13 months from the time the trees were set, 50 to 139 peaches being obtained from each tree. The Giant prune, one of the finest varieties grown in California, is being successfully grown on Lombard stock in New York, where the thermometer sometimes goes down to 25° below zero.

Relative to the use of cover crops in orchards, the author states that there is a limit beyond which it may not be safe to use clover. He believes that after 3 years of crimson clover in an orchard, a crop of rye or some other nonleguminous plant should be sown. Too much nitrogen in the soil appears to make lighter colored fruit and lessens the keeping qualities of the fruit.

Renewal pruning, E. S. Goff (*Amer. Gard., 23 (1902), No. 385, pp. 302, 303*).—The author points out that as apple trees increase in age the size of the fruit tends to become smaller. This he believes is due to the increased difficulty of sap circulation in the fruit-bearing twigs. An instance is pointed out in which water sprouts on part of an apple tree were allowed to develop in place of a large limb that had been broken off. The fruit on this portion of the tree was much larger than on the remaining older portions of the tree. The question is therefore raised whether the size of fruit on old apple and pear trees cannot be maintained by a careful system of renewal pruning.

Two new apricots, P. Mouillefert (*Jardin, 16 (1902), No. 360, pp. 56, 57, col. pl. 1*).—Two seedling apricots, which are considered of considerable merit, are described and the fruit and leaves illustrated with a colored plate.

Stringfellow method of planting peach trees, H. M. Collingwood (*Proc. New Jersey State Hort. Soc., 27 (1902), pp. 52–60*).—An account is given of the successful growth of peach trees when planted on steep rocky hillsides in New York, which were capable of producing fair crops of rye, potatoes, and grass. The trees were pruned to straight stubs and the holes made for setting them were dug with a crowbar. A cup of water was poured in each hill, the stub put in place, loose sand poured in, and the soil firmly packed about the trees. Out of 100 trees thus set, 96 made a favorable growth the first season, the roots making a strong downward growth.

Moderate v. severe thinning of peaches, A. T. Jordan (*Amer. Agr. (mid. ed.), 69 (1902), No. 21, p. 700*).—The effect of thinning peaches was observed in 1901 on two trees that were set out in 1897. The set of fruit on one tree was 862 peaches and on the other 852 peaches. From the first tree 69.5 per cent of the total set of fruit was removed, leaving to mature 263 peaches. From the second tree 31.9 per cent of the fruit was taken, leaving to mature 580 peaches. From the tree which had been most heavily thinned 2.83 baskets of fruit were obtained. The average weight of the peaches from this tree was 4.48 oz., the price offered per basket by leading grocers $1, and the total value of the peaches from the tree $2.83. From the tree less severely thinned 3.92 baskets of fruit were obtained. The fruits from this tree averaged 2.81 oz. each, for which leading grocers offered but 45 cts. per basket, making the total value of the fruit from this tree but $1.76. The immediate financial result of thinning in this case was $1.07. Further observation of the two trees showed that 46.6 per cent more fruit buds matured on the tree severely thinned during the season than on the other tree. Figured out on the basis of an acre and allowing 160 trees to the acre, there was an advantage in thinning of $171.20.

Fertilizer experiments with sour cherries and plums (*Deut. Landw. Presse, 29 (1902), No. 29, p. 25, figs. 2*).—The greater growth of the trees, heavier fruit production, and greater profits obtained by adding potash to the fertilizers used in growing cherries and plums, are brought out in tables and illustrations.

Notes on strawberries, H. C. Price and E. E. Little (*Iowa Sta. Bul. 64, pp. 186–208, figs. 5*).—Results are reported of a test of 75 varieties of strawberries for 1899, and of 92 varieties for 1901. Each of these varieties is briefly described and in addition directions are given for the culture of strawberries, including location of the bed, cultivation, winter protection, protection from spring frosts, and from insect and fungus enemies. The opinions of 22 prominent strawberry growers in the State as to the best varieties for market and home use, the distance apart plants should be set, winter protection of plants, and the number of years a plantation should be fruited, have also been brought together in tabular form. In the station experiment the 5 heaviest yielding varieties were Lovett, Kansas, Bederwood, Afton, and Warfield. The varieties oftenest recommended by growers throughout the State were Warfield, Bederwood, Crescent, Clyde, and Lovett, mentioned in the decreasing order of their importance. In the station tests the average yield of 60 staminate varieties fruited in 1901 was 2,059 qts. per acre and the average yield of 29 pistillate varieties 2,351 qts. When, however, the 10 heaviest yielding staminate varieties were compared with the 10 heaviest yielding pistillate varieties the average yield was slightly in favor of the perfect or staminate varieties.

Some strawberry books, C. H. Payne (*Gard. Chron., 3. ser., 32 (1902), No. 816,* *pp. 109, 110*).—A list is given of a number of books on strawberries published in England, France, Germany, and America.

The cranberry industry (*Sci. Amer., 86* (*1902*), *No. 12, pp. 206, 207, figs. 6*).—A general article discussing methods of growing, with illustrations of modern ways and an account of the cranberry districts, yields, etc.

Field grafting and bench grafting (*Pacific Rural Press, 63* (*1902*), *No. 20, p. 328*).—The advantages of bench grafting grapes over field grafting are discussed.

Stocks for calcareous soils, L. Ravaz (*Prog. Agr. et Vit.* (*Éd. L'Est*), *23* (*1902*), *Nos. 3, pp. 73–75, pl. 1; 4, pp. 100–102, pl. 1; 5, pp. 134–136, pl. 1; 8, pp. 230–233, pl. 1; 13, pp. 369–371, pl. 1; 17, pp. 482–484, pl. 1*).—A short descriptive review is given of the stocks that may be profitably employed on calcareous soils.

Electricity for cultivation of plants (*Tradesman, 47* (*1902*), *No. 12, p. 65*).—A brief note on experiments by J. Fuchs in the use of atmospheric electricity in grape culture.

Instantaneous bleaching liquid for nuts, G. E. Colby (*California Sta. Rpt. 1899–1901, pt. 1, pp. 57–61*).—The recent enormous crops of walnuts in California have made it necessary to provide rapid-acting bleaching solutions in order that great numbers of carloads of nuts may be simultaneously brought into marketable condition. Tests have therefore been made at the station of different bleaching solutions to determine their relative values. In the experiments walnut culls two years old were used. The stains on these were dried, hard, and more fixed in character than those ordinarily found on fresh nuts.

The first formula used consisted of 6 lbs. of chlorid of lime, 12 lbs. of sal soda, and 50 gal. of water. Walnut culls treated with this solution for 5 minutes were made acceptable in appearance and salable. When to this same formula dilute sulphuric acid (0.15 per cent of acid in 50 gal. of water) was added, the nuts were bleached in from 5 to 10 seconds, and after washing presented a clean appearance and were acceptable to the trade. The nuts were not injured in the least by this method of treatment. When dilute acetic acid (0.22 per cent in 50 gal. of water) was substituted for the sulphuric acid, the results were equally good and there was no development of rancidity in the nuts with perfect shells after they had stood a month. These same percentages of sulphuric acid and acetic acid were also used with another formula made up of 25 lbs. of bleaching powder, 18 lbs. of sal soda, and 50 gal. of water. This formula without the acids cleaned the nuts in 5 minutes, and with the acids in from 5 to 10 seconds. Treatment for 5 minutes with a 1 per cent solution of bisulphite of calcium failed to remove the stains, even when a little dilute sulphuric acid was added. Laboratory experiments with both bleaching powder formulas showed that they could be used successively as many as four times, and it is recommended to use them until exhausted, which is shown by failure to evolve chlorin gas when fresh sulphuric acid is added.

The results of the station's work with the instantaneous bleaching formulas suggest the following formula as being most satisfactory for commercial use: Sal soda, 12 lbs.; chlorid of lime, 12 lbs.; water, 45 gal. dilute sulphuric acid as noted above. The method of preparing and using it on a large scale is described. By having proper drain boards to save the bleaching solution, 4 to 5 tons of walnuts can be bleached with 50 gal. The cost of the material for bleaching nuts by this method is about 40 cts. per ton. It is stated that certain persons in the State have claimed to hold patents for instantaneous methods of bleaching nuts, but the above processes are not patentable, since they were given to the public by the station in 1896. Their use is believed to be perfectly harmless and to have no other effect than that desired.

Distribution of seeds, plants, cuttings, etc., E. J. Wickson (*California Sta. Rpt. 1899–1901, pt. 1, pp. 96–123*).—An account is given of the seed distributed during the year, with short reports by farmers from different sections of the State as to the manner in which they have succeeded. These reports are similar in character to those of previous years (E. S. R., 12, p. 936).

The paper mulberry (*Broussonetia papyrifera*) has been found to be about as hardy as the orange. The Asia Minor willow (*Salix salmoni*) planted from cuttings in 1895 was 32 ft. high in October, 1897, with trunks 22 in. in circumference. *S. alba* under like conditions was but 12 ft. high with a trunk 8 in. in circumference. A number of species of Eucalyptus are promising in certain sections of the State. Acacias have succeeded well in the university plantations and are strongly recommended. Sallywood of Lord Howe Island (*Lagunaria patersonii*) appears to be a desirable ornamental for the shrubbery or home gardens. The English oak (*Quercus robur*) seems to be one of the most rapidly growing hard wood trees thus far grown in California. The tree tomato (*Solanum betaceum*) seems to be about as tender as the lime. The edible pod pea has given quite general satisfaction. The asparagus pea (*Tetragonolobus purpureus*) has not proved satisfactory as a green manuring plant but is gaining favor as an edible pea. The Kansas Standard tomato has given good satisfaction and was the first variety to ripen seed at the station for a number of years. Turkestan winter muskmelons have proved four times as prolific as common garden varieties of muskmelons planted under similar conditions. The Khama melon, a stock melon, yielded at the rate of 22 tons per acre at the Pomona Substation. Cows and horses ate them readily. Hairy vetch not only made a fine winter growth but proved exceptionally resistant to drought and in many places grew during the dry season without irrigation. Modiola (*Modiola decumbens*), a forage plant, grew especially well on alkali lands in Kern County, and was eaten by sheep and cows in preference to alfalfa.

Other plants mentioned are the New Zealand oil tree, strawberries, vegetable marrow, various beans, kale, Jerusalem artichokes, pumpkins, watermelons, cereals, field peas from Russia, bitter vetch, various lupines, fenugreek, Australian saltbushes, and a number of pasture grasses.

FORESTRY.

Handbook of the trees of New England, L. L. DAME and H. BROOKS (*Boston: Ginn & Co., 1902, pp. XV + 196, pls. 87*).—This volume gives descriptions and full plate illustrations of the trees of New England, and while primarily prepared for that region it is applicable to a much wider range, most of the species being quite widely distributed over the eastern United States. In order that the descriptions may be readily compared, the text is arranged under conspicuous paragraph headings, and in addition to the botanical description and illustration of all the important features, every species is discussed in its horticultural aspect, its value for park and other planting being shown. As far as could be done with conciseness and clearness popular terms have been adopted, and the book will be found of value to all who are in any way interested in trees.

The [California] forestry substations, C. H. SHINN (*California Sta. Rpt. 1899-1901, pt. 1, pp. 142-144*).—A brief report is given of the progress made at the forestry substations in California during the 3 years covered by the report. The principal improvements have been made at the Santa Monica and San Joaquin Valley stations. New tree plantations have been made and a number of species of forest trees have been tested under the conditions existing at these stations. The present condition of a large number of species of trees planted in the San Joaquin Valley is briefly indicated.

Forestry in Iowa, W. GREENE (*Proc. Iowa Park and Forestry Assoc., 1 (1901), pp. 46-51*).—The author believes that forestry plantings are not to be recommended as individual efforts but should be carried on by corporations or the State, the investment and time being too great for the individual. While it is not expected that large areas of Iowa land will be used for timber culture, yet the steep slopes along streams should be replanted with the most valuable forest trees suitable to the location. Most of the forest trees when planted on exposed places in the western part of the State need protection from the strong westerly winds by wind-breaks, for which purposes cottonwood, maple, willow, red cedar, Austrian pine, and white spruce are recommended. Of the forest trees most desirable for planting, the author enumerates the black walnut, butternut, white and green ash, black cherry, hackberry, catalpa, honey locust, sugar maple, hickories, oaks, cedars, spruce, and pine. In addition to the æsthetic consideration and as a permanent investment, a number of the species will produce rapid growth, and willow and catalpa will make posts in 10 years, cottonwood will produce logs in 25, and larch and cedar will be fit for telephone poles in from 25 to 50 years, while oaks will make fence posts and railway ties in about the same length of time.

Trees of the Big Horn forest reserve, A. Estella Paddock (*Proc. Iowa Park and Forestry Assoc., 1 (1901), pp. 75–77, pl. 1*).—The deciduous trees of the Big Horn forest reserve are said to be *Populus angustifolia*, *P. tremuloides*, green ash, box elder, and various species of willow. Of the coniferous species represented, the yellow pine is most abundant, and associated with it are *Pinus flexilis*, Douglas spruce, lodge pole pine, and Engelmann spruce, balsam fir, and mountain cedar.

Trees of the Priest River forest reserve, J. C. Blumer (*Proc. Iowa Park and Forestry Assoc., 1 (1901), pp. 77–80*).—The principal species of trees occurring in this forest reserve are said to be the western white pine, yellow cedar, tamarack or western larch, Douglas spruce, yellow pine, Engelmann spruce, western hemlock, white fir, lodge-pole pine, white pine, yew, red cedar, together with a few deciduous trees such as cottonwoods, maples, and birch.

Special report of the forestry bureau, Philippine Islands, G. P. Ahern (*Spec. Rpt. War Dept., 1901, pp. 60, pls. 33*).—A report is given of the activity of the forestry bureau of the Philippine Islands from April, 1900, to July, 1901. The personnel of the bureau is described and the system of regulations and licenses is reported upon at considerable length. The methods of procedure and forms prescribed by the regulations are shown. The number of licenses granted for timber, firewood, dyewood, rubber, etc., during the time covered by the report amount to 580. The different kinds of timber have been classified and arranged into groups, the popular and scientific names of which are given. A brief description is given of the forests of the Philippines, and the amount of different kinds of timber taken during the time covered by the report is indicated. The author believes that if the proper safeguards be adopted the Philippine forests will not only be a source of great revenue, but may be maintained without serious depreciation.

Forestry in Saxony, E. L. Harris (*U. S. Consular Rpts., 69 (1902), No. 261, pp. 244, 245*).—The forests of Saxony are divided into 12 principal districts, which are again subdivided into 100 minor districts. The author gives a report on the value and income derived from these forests, arranged according to the different districts. The total value of the forests is about $80,000,000, and the income for the year reported was $3,246,976.42, with expenses amounting to $1,005,364.85, making a net average income of 2.71 per cent.

Report on forest administration in Burma for 1900–1901 (*Rpt. Forest Admin. Burma, 1900–1901, pp. 173*).—The forest reserve area of Burma was increased during the period covered by this report by 684 square miles, the total being now 17,836 square miles. The reserve forests of Burma are divided into four circles, each of which is reported upon in detail. Preliminary surveys have been made of a considerable portion of the reserves, but as yet working plans for extensive areas have not been begun. The principal forest product exploited is teak timber, but a number of secondary timber products are mentioned and during the year sanction was given for the planting of 10,000 acres in para rubber (*Hevea brasiliensis*), work on which has been begun. A number of other experimental plantations are reported upon and tables given showing the financial returns from the different regions. During the year covered by this report the total income from the forests amounted to 7,706,324 rupees, equivalent to more than $2,500,000, a decrease of about $100,000 from the revenue of the previous year. This decrease is said to be attributed to a prolonged dry season, which prevented the marketing of a large amount of timber.

Report on forest administration in the Punjab for 1900–1901, C. F. ELLIOTT (*Rpt. Forest Admin. Punjab, 1900–1901, pp. 80*).—The forest area of the Punjab, under the administration of the authorities, amounts to 6,408,272 acres, which is classified as reserve, protected, and unclassified. The increase during the year covered by the report amounted to 353,320 acres. During the year covered by the report the cultural operations and exploitation were seriously hindered by the prevailing drought. The number of forest fires decreased from 227 to 140, and the area burned over diminished in nearly equal proportion. The net income received from the various forest products was 36 per cent of the gross receipts. Detailed reports are given of the natural results and operations in the different districts.

Report of forest administration in the Hyderabad assigned districts, 1900–1901, C. BAGSHAWE (*Rpt. Forest Admin. Hyderabad, 1900–1901, pp. 41*).—During the year covered by this report 223 square miles were removed from the forest area of the Hyderabad district, which at present consists of 3,953 square miles. Owing to the drought the income from grazing was greatly reduced and the net receipts of the commissioner of forests were about 50 per cent less than the previous year. The working plants of the different divisions are described and discussed in detail. The area of state forests in different districts is shown in tabular form, as well as the production of timber, fuel, and other forest products.

City forestry, L. A. GOODMAN (*Missouri State Bd. Agr. Rpt. 1902, pp. 439–448*).—The desirability of tree planting in cities is pointed out and suggestions given for the growing, planting, and handling of trees, as well as for their protection.

Winter aspect of the woods, CHARLOTTE M. KING (*Proc. Iowa Park and Forestry Assoc., 1 (1901), pp. 71–74, fig. 1*).—Brief notes are given on the winter condition of a number of the more common forest trees.

The cork oak, J. H. MAIDEN (*Agr. Gaz. New South Wales, 13 (1902), No. 2, pp. 187–190, pls. 2*).—A description is given of the growth of the cork oak (*Quercus suber*) in New South Wales. Several specimens are described, which are said to have made a satisfactory growth, and the tree is believed to be adapted to a number of localities throughout the country. Young trees are offered for planting in different regions to test the suitability of different regions for the growing of this important tree. Notes are given relative to the growing of the cork oak in Queensland, California, and elsewhere.

The comparative temperature of birch, fir, and pine, V. T. LUGUININE (*Izv. Moscow Selsk. Khoz. Inst. [Ann. Inst. Agron. Moscou], 7 (1901), No. 2, pp. 71–84*).—Two series of experiments were carried on by the author between April, 1889, and December, 1892, in which the internal temperature of birch, fir, and pine was investigated. The first series of experiments was conducted on birch and fir which grew on clay soil, the trees having attained a diameter of 30 cm. The birch and pine in the second experiment grew on sandy soil and were all about the same average size. The thermometers used were bent at right angles, the shorter limb carrying the mercury bulb inserted into the interior of the trunk on the north side, the longer limb remaining parallel to the trunk. Readings were taken in the first series three times a day during the vegetative period of the trees and once a day during the remainder of the year. In the second series the readings were made daily at 1 p. m. The results of investigations are shown in curves which indicate the differences in temperature between the birch and fir on the one hand and the birch and pine on the other. The curves show that during the summer months the temperature fluctuated with the temperature of the surrounding atmosphere. The differences between the fir and birch were greater than between the pine and birch, the maximum variation being 6.9° C. when the temperature of the air was 25° C., the difference between the pine and birch being 3.3°.—P. FIREMAN.

SEEDS—WEEDS.

Annual report of the seed-control station at Vienna, T. VON WEINZIERL (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 3, pp. 515–548*).—A report is given of the investigations conducted at the seed-control station in Vienna for the year ended July 1, 1901. During this period 27,238 samples of seed were examined, and 11,356 packages of seed were attested and sealed, the most of which were red clover and alfalfa seed. A detailed report is given, showing the maximum, minimum, and average purity and germination of all of the principal seeds tested. The investigations of forage plant seeds for the presence of dodder is reported upon, in which a slight increase in the percentage of samples containing this parasite is reported. Separate reports are given of the investigation of beet seed, flaxseed, forest tree seed, and cereals. Notes are also given on a number of plant diseases which were identified at the station during the year. The laboratory and field experiments with various culture crops are briefly described.

A study on the germination and growth of Leguminosæ, especially with reference to small and large seed, F. G. MILLER and L. H. PAMMEL (*Iowa Sta. Bul. 62, pp. 155–177, pls. 5*).—This is a reprint from an article in the proceedings of the twenty-second annual meeting of the Society for Promotion of Agricultural Science, 1901 (E. S. R., 14, p. 52).

Plants injurious in agriculture and horticulture, E. MENAULT and H. ROUSSEAU (*Les plantes nuisibles en agriculture et en horticulture. Paris: Octave Doin, 1902, pp. XVII, 314, pls. 80*).—Illustrations and descriptions are given of a number of the more troublesome weeds occurring in France, together with parasitic phanerogams, and a number of plant diseases. Among the plant parasites those described are the principal fungi which attack cereals, the grape; the mildews of potato, lettuce, beets; and several species of Cuscuta and Orobanche occurring on various leguminous plants. The third part of the work is taken up with methods for the destruction of these various pests, in which cultivation, treatment with chemicals, the growing of heavy crops which smother out the weeds, and the use of fungicides for the prevention of plant diseases are described.

The broom rapes, R. ROGER (*Jour. Agr. Prat., n. ser., 4 (1902), No. 32, pp. 186, 187, fig. 1*).—Brief descriptions are given of *Orobanche epithymum*, *O. rapum*, and *O. minor*, and suggestions given for the eradication of these pests.

Broom rape, G. MARTINET and A. ESTOPPEY (*Chron. Agr. Canton Vaud, 15 (1902), No. 14, pp. 402–404, fig. 1*).—A description is given of the common broom rape (*Orobanche minor*). This is parasitic on alfalfa and also other species of clover. For its destruction the authors suggest the pulling up of the plants before the maturity of the seed, but where that is impracticable the covering and burning of the affected plants, both host and parasite.

Dodder—its life history and remedies, D. MCALPINE (*Jour. Dept. Agr. Victoria, 1 (1902), No. 3, pp. 325–329*).—A description is given of *Cuscuta epithymum*, a species of dodder which affects alfalfa, clover, and other plants. The life history, local characteristics, and distribution of this parasite are given and various suggestions offered for its control. Among the remedies offered are cutting the crop before the dodder matures its seed, burning over affected areas, spraying with a 5 per cent solution of iron sulphate, or watering the area affected by the parasite with sulphuric acid at the rate of 1 part to 200 parts of water.

Concerning the destruction of mustard by spraying, F. Smeyers and J. Vandervaeren (*Rev. Gén. Agron. [Louvain], 11 (1902), No. 6, pp. 309–312*).—A brief account is given of experiments in which solutions of sulphate of copper, sulphate of iron, and nitrate of copper were sprayed over oat fields for the destruction of mustard. The relative efficiency and cost of application of these different herbicides are shown, and comparing the cost the nitrate of copper is in some respects to be preferred. It is less expensive than the sulphate of copper, and when sprayed at the rate of 900 to 1,000 liters per hectare the amount of nitrogen present has a fertilizing value equal to an application of 8.5 kg. of nitrate of soda upon the same area.

Experiments on the destruction of charlock by spraying (*Dept. Agr. Cambridge Univ. Rpt. 1902, pp. 15, 16*).—Experiments were carried on in barley and oat fields sown with clover and grasses to test the efficiency of solutions of nitrate of soda for the destruction of charlock. This chemical has been recommended as a valuable herbicide as well as having recognized value as a fertilizer. In May plats of an acre each were sprayed with different amounts of 10 and 20 per cent solutions of nitrate of soda, and comparisons are made with the results obtained from a plat of 7 acres sprayed with copper sulphate. In no case did the nitrate of soda show any appreciable effect upon the charlock. The area sprayed with a 4 per cent solution of copper sulphate at the rate of 40 gal. an acre was almost completely cleared of charlock without any injury to the barley, oats, or clover plants. The areas treated with the nitrate of soda were so infested with weeds that it was resolved to spray them when the charlock had come into flower with a 4 per cent solution of copper sulphate. Even at this advanced stage of growth the effect was quite marked and but few charlock plants survived the treatment.

A brier and blackberry bush eradicator, H. W. Potts (*Jour. Dept. Agr. Victoria, 1 (1902), No. 1, p. 27*).—It is said that the sulphuric acid left in the flasks used in testing milk samples is of practical value for destroying briers, blackberry bushes, wild roses, etc. Half a pint of this waste acid poured about the stem of a plant and the main roots will destroy the bushes within a few days.

DISEASES OF PLANTS.

Report of the mycologist, F. D. Chester (*Delaware Sta. Rpt. 1901, pp. 36–50, figs. 9*).—A report is given of some diseases of cantaloupes, treatment for pear canker, experiment in bagging plums for the prevention of plum rot, and spraying for the treatment of plum rot. Among the diseases of cantaloupes 2 leaf blights, one due to *Macrosporium cucumerinum*, and a second due to an undetermined species of Cercospora, are described. These leaf blights are reported as being associated with each other and have caused considerable losses by checking the growth and preventing the ripening of fruit. In one locality it is estimated that half the crop was lost, due to these diseases. The technical characters of the fungi are described at considerable length. In the case of the leaf blight due to the Cercospora, efforts to obtain cultures from which inoculation experiments could be conducted have failed, but further investigations will be made in this direction.

A third disease of the cantaloupe, called stigmonose, is characterized by a bleaching of the chlorophyll along the veins of the leaf. It is believed that this is caused by aphid punctures and recourse should be had to insecticides to keep the melon vines free from plant lice.

The experiments for the treatment of pear canker are in continuation of the description of the disease previously given (E. S. R., 13, p. 254). The canker was generally prevalent during the year covered by the report, being especially troublesome among Keiffer trees. The disease apparently became chronic and a number of trees were entirely destroyed. Prior to the death of the trees the foliage assumes a yellowish appearance and the diseased bark becomes cracked and loosened from the trunk. Experiments were conducted for the prevention of the disease, in which the loose bark was removed from the affected portions of the trees, after which the scraped areas were covered with a copper-whale-oil soap mixture, a mixture of formaldehyde and glycerin, and a Bordeaux-resin soap mixture. The directions for the preparation of the different fungicides are given, and as a result of the treatment the formaldehyde-glycerin mixture is recommended as promising and worthy a more extended trial.

An experiment is reported in which the protection of pear trees against blight by spraying with a lime-sulphid solution was investigated. As there was only a slight amount of blight observed during the season, the results obtained are of a negative nature. The same experiment is to be repeated during the coming season.

On account of the frequent rotting of plums, even when thickly coated with Bordeaux mixture, an experiment was conducted in which the fruit was incased in paper bags some time before ripening, the object being to ascertain the time of infection of the fruit and the efficiency of this method of protection. Covering the plums with bags slightly diminished the amount of rot, but not to any material degree. Plums covered by bags and protected against insect punctures during the susceptible period of infection showed from 36 to 91 per cent rotten fruit. In a number of experiments the fruit was thickly covered with Monilia spores before bagging but this treatment did not markedly increase the amount of rot. From these experiments it is concluded that plums become infected through other channels than by the direct infection of the fruit itself, and this explains why the fruit so frequently rots when thickly covered with Bordeaux mixture or other fungicide. A cooperative experiment is reported in which a Bordeaux-resin mixture was sprayed over plum trees to protect against the rot. After spraying, the trees were inspected at intervals, and although the fungicide was plainly visible covering the fruit, the percentage of rotten plums was very high, the fungicide offering little if any protection.

Notes and observations on plant diseases, 1901, J. PERCIVAL (*Jour. Southeast. Agr. Col., Wye, 1902, No. 2, pp. 81–89, figs. 3*).—The author reports the observation of a number of plant diseases during the season of 1901. Among those mentioned are the barley smuts, due to *Ustilago nuda* and *U. jensenii*, for the prevention of which soaking the seed in copper solutions or the hot-water treatment is recommended. The leaf scorch of cherries, caused by the parasitic fungus *Gnomonia erythrostoma*, is described. Only cherries of the Bigarreau and Heart types were affected. The fungus attacks the leaves, diminishing their vitality, and later sometimes attacks the fruit, which is developed irregularly. Malformed pears, due to attacks of a species of Cladosporium, are also briefly described, and the occurrence of a leaf scorch of orange and lemon trees grown in a hothouse is mentioned. The cause of the leaf scorch is said to be an attack of the fungus *Glœosporium hendersonii*. The chrysanthemum rust (*Puccinia chrysanthemi*) is mentioned and a disease of the apple in which the 1-year-old twigs are attacked by a species of Melanconium is described. A wilt disease of hops due to *Fusoma parasiticum* and an eelworm of hops (*Heterodera schachtii*) are described.

Plant diseases, G. MASSEE (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1902*), *No. 4, pp. 724–744, figs. 11*).—This paper consists of a résumé of a series of lectures treating of the general conditions regarding plant diseases, and gives descriptions of a number of the more common fungus diseases of herbaceous plants, fruit and other trees.

New heterœcious rust fungi, H. KLEBAHN (*Ztschr. Pflanzenkrank, 11* (*1901*), *No. 4–5, p. 193*).—Brief notes are given upon a number of heterœcious rust fungi in which the alternate hosts are mentioned. The Æcidium of *Coleosporium pulsatillæ* is said to occur on the needles of *Pinus silvestris*, where the fungus is known as *Peridermium jaapii*. *Melampsora allii-salicis* has for its Cæoma host different species of Allium, and the uredo and teleutospores occur on *Salix alba*. *Melampsora allii-populina* forms its Cæoma on species of allium, and uredo and teleutospores on *Populus nigra*. *Melampsora galanthi-fragilis* occurs on *Galanthus nivalis*, with the uredo and teleutospores upon *Salix fragilis*, and also *S. pentandra*. *Æcidium elatinum* is said to be associated with *Melampsorella cerastii*. *Puccinia cari-bistortæ* is said to be identical with *P. angelicæ-bistortæ*. The teleutospores of *Æcidium pastinacæ* are reported as occurring upon *Scirpus maritimus*.

On the hot-water treatment of cereal grains for the prevention of smut, H. Rommetin (*Jour. Agr. Prat., n. ser., 3 (1902), No. 14, pp. 440, 441*).—Directions are given for the hot-water treatment of cereals for smut prevention, and the value of such treatment is pointed out. The cost of treating the seed required for sowing 1 hectare (about 2½ acres) by the method suggested by the author need not exceed 20 cents. In the case of oats so treated, it is claimed that a loss of 5 to 10 per cent could be avoided and the treatment much more than paid for.

The difference between smut and bunt, E. Druce (*Queensland Agr. Jour., 10 (1902), No. 2, pp. 86, 87*).—The differences between the bunt or stinking smut and the loose smut of wheat, oats, barley, and rye are popularly indicated, and the treatment of the seed by soaking in solutions of copper sulphate is recommended.

The wilt disease of the cowpea and its control, W. A. Orton (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 17, pp. 22, pls. 4*).—The results of investigations of the wilt disease of the cowpea (E. S. R., 11, p. 944) are given. The disease first makes its appearance when the plants are about 6 weeks old. Growth is checked and the stem shows a faint reddish-brown tinge. The affected plants drop their leaves, the lower ones falling first. The spread of the disease is gradual, and it usually makes its appearance in spots throughout a field, spreading from these centers. The cause (*Neocosmospora vasinfecta tracheiphila*) is described, and the manner of infection and spread indicated. While resembling the wilt of cotton and watermelons, the diseases are not intercommunicable. So far it is known to occur in North Carolina, South Carolina, and Alabama, and it is thought probable that it occurs elsewhere. As yet the disease has not caused serious loss except in a few localities, but there is great danger anticipated from its future spread. Land affected by this disease is said to be pea-sick, but the real reason for the failure of the growth of the peas is the presence of the fungus in the soil. How long the land remains infected in the case of the cowpea wilt is unknown.

For the prevention of this disease the rotation of crops and the substitution of other leguminous crops which are not subject to the fungus are recommended, or the growing of resistant varieties, one of which (the iron pea) is said to be immune to disease. The results of experiments with a large number of varieties of cowpeas and other leguminous plants are given, and the relative susceptibility to disease is indicated.

A cowpea resistant to root knot, H. J. Webber and W. A. Orton (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 17, pp. 23–38, pls. 2*).—While investigating the subject of the wilt disease of cowpeas the authors discovered that one variety (the iron cowpea) was almost entirely free from attacks of the nematode *Heterodera radicicola*, the other varieties being almost destroyed by it. Notes are given on the development and distribution of root-knot nematodes, largely compiled from Alabama Station Bulletin 9 (E. S. R., 1, p. 185) and Massachusetts Station Bulletin 55 (E. S. R., 10, p. 1055). The use of resistant varieties in stocks for the prevention of attacks of various diseases and insect pests is commented upon and attention called to the freedom of this variety from attack. The possibility of breeding nematode-resistant plants is commented upon.

A new disease of potato, S. Guéraud de Laharpe (*Jour. Agr. Prat., n. ser., 3 (1902), No. 15, pp. 481, 482*).—A summary is given of the investigations of Delacroix on the bacterial disease of the potato due to *Bacillus solanincola*. This disease has been under investigation for some time. For its prevention the planting of sound tubers and 4-year rotation, the use of entire tubers which are to be treated before planting with a 1:20 solution of formalin, and the planting of the potatoes as late in the season as possible, allowance being made for the harvesting of the crop, are recommended.

A new disease of potato, R. Roger (*Rev. Hort. [Paris], 74 (1902), No. 4, pp. 94, 95*).—A summary is given of the previous publications of Delacroix and others relating to the bacterial disease of potatoes caused by *Bacillus solanincola*.

The brown disease of potatoes, C. E. Bessey (*Science, n. ser., 15 (1902), No. 372, p. 274*).—For several years the potato crop of Nebraska is reported as having been seriously damaged by a disease which caused the fibrovascular bundles of the tubers to turn brown. This disease is said to be widely distributed in America and Europe, but as yet no satisfactory cause for it has been discovered. A series of experiments was begun in the laboratory of the University of Nebraska to determine, if possible, what produced this disease. Cultures made from diseased tubers soon showed tufts of mold filaments projecting from the diseased bundles. These, upon development of their fruits, proved to be the filaments of *Stysanus stemonites*. Repeated experiments were made in which, in every case, cultures of the brown bundles produced the fungus, while those which were not discolored were wholly free from the fungus. Tubers examined from a number of parts of Nebraska, as well as from other States, showed the presence of the fungus. These experiments have been continued for a number of months, and it is believed that *Stysanus stemonites* is the cause of the disease.

The snow mildew, P. Sorauer (*Ztschr. Pflanzenkrank., 11 (1901), No. 4–5, pp. 217–228*).—Under this name the author describes a disease of rye which he says has been known for a long time, but has been given but little consideration. The cause of the disease is said to be *Fusarium nivale*. The history and systematic relationship of the disease is discussed at considerable length and the action of the fungus when freely growing in the field and in inoculation experiments is described.

A new parasite of sugar beets in Egypt, V. Mosseri (*Ann. École Nat. Agr. Montpellier, n. ser., 1 (1902), No. 3–4, pp. 310–319*).—*Orobanche tinctoria*, or *O. lutea*, as it is sometimes called, is reported as growing parasitically on the roots of sugar beets in Egypt. The plant has long been known in that country, but was first noticed as occurring destructively on beets in 1900.

Diplodia cacaoicola, a parasitic fungus on sugar cane and cacao in the West Indies, A. Howard (*Ann. Bot., 15 (1901), No. 60, pp. 683–701, pls. 2*).—While pursuing the study of the rind fungus of sugar cane, reported in E. S. R., 13, p. 466, the author frequently distinguished a second fungus which exhibited little difference from that which is considered the Melanconium stage of the rind fungus *Trichosphæria sacchari*. This disease is commonly called the rind fungus or root disease wherever it occurs, and subsequent investigations have shown that the predominant fungus on canes examined from a number of localities is identical with that just mentioned, and experiments were undertaken to develop the fungus under artificial conditions. Pure cultures were successfully grown, and inoculations made showed that the fungus was truly parasitic on the sugar cane.

An investigation of the fungus found on the pods and branches of the cacao tree showed that, so far as the characters of the pycnidia and spores are concerned, it agrees exactly with the form described on the sugar cane. Artificial cultures from the cacao were carried out in a similar manner to those made with the sugar-cane fungus, pure cultures being made from the fungus obtained from the pods as well as from the cacao trees. The infection experiments showed that the fungus could live as a parasite on the cacao pods and is a dangerous wound parasite of the tree itself.

On account of the resemblance between the two, infection experiments were conducted in which mycelium from cacao trees and pods was transformed to sugar cane and the sugar-cane fungus to the cacao. The cross-infection experiments were very successful and leave no doubt as to the identity of the two fungi. In suggesting remedial measures for checking the ravages of this fungus, it is stated that all cacao pod husks should be removed and burned, and all the diseased pods noticed on trees should be similarly destroyed. In the cultivation of sugar cane, the diseased canes should be regularly collected and burned. In this way there will be less chance for infecting a new crop. The systematic position of the fungus is discussed at some length.

Observations on the mosaic disease of tobacco, A. F. Woods (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 18, pp. 24, pls. 6*).—A summary is given of the author's investigations on the cause of the mosaic disease of tobacco and similar diseases of other plants. The work of a number of other investigators is reviewed, and the author's publications relative to this disease (E. S. R., 12, pp. 216, 217) are summarized. The author claims to be able to artificially produce the disease, and that it is due to a disturbance of the normal physiological activity of the cells. The reduction of the available nitrogenous reserve food may cause the disease, and rapid growth caused by too much nitrogenous manure is favorable to it. It may also be caused by a severe cutting back of plants or by transplanting when rapidly growing. When once started the disease is believed to be continued by the action of the oxidizing enzyms as previously noted.

Black rot of ginger, A. Howard (*Bul. Bot. Dept. Jamaica, 9 (1902), No. 3, p. 42*).—The occurrence of black rot on a number of specimens of ginger roots is reported. In continuation of the suggestions of the paper mentioned above, the author calls attention to the necessity of isolating the diseased patches by trenches, throwing the soil on the affected areas, and destroying the diseased plants by burning. In planting, care should be taken to select perfectly healthy rhizomes from the best fields and to soak these for a few hours in Bordeaux mixture.

A new banana disease in Egypt, A. Preyer (*Jour. Khedir. Agr. Soc. and School Agr., 3 (1901), No. 5, pp. 242, 243*).—For about three years a peculiar disease has been noticed spreading among the bananas cultivated in the vicinity of Alexandria, Egypt. The first symptoms of the disease are observed in a sudden checking of the growth, after which the tips of the leaves and the young central leaves become black and die. The stem does not die immediately but is rendered unfit to bear fruit. The great damage done by the disease led to its investigation. A badly infected stem was dug up and together with its roots cut in longitudinal direction. In the upper part the youngest leaves were all black and rotten, while the outer layers were white and seemed sound. The lower part of the stem and root stalk showed no sign of disease. The roots themselves exhibited toward their ends small excrescences usually accompanied by a resin-like material. Sections of these knob-like growths were examined and found to be filled with nematodes, and further investigations showed that the banana disease was due to infection of the roots by the nematodes which in this case belonged to the genus Tylenchus, the species resembling *T. acutocaudatus*. The nematode was found to be not only present in the roots, but was met with in considerable numbers in the upper parts of the stem. Experiments are being conducted for the prevention of the disease, but as yet no definite results have been obtained.

Observations on the mulberry dwarf troubles, a widely spread disease in Japan, U. Suzuki (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 359, 360*).—In a previous publication (E. S. R., 13, p. 866) the author reported on the relation between oxydizing enzyms in healthy and diseased mulberry leaves. Numerous tests have been made in continuation of his previous investigations, and as a result the author concludes that oxidase and peroxidase are present in larger quantities in diseased leaves than in the healthy ones. Peroxidase is always more prevalent than oxidase in the diseased leaves. Catalase seemed present in a majority of cases in greater quantity in the diseased leaves.

Experiments in the prevention of Peronospora of grapes, F. Zweifler (*Weinlaube, 1901, No. 15, p. 176; abs. in Centbl. Agr. Chem., 30 (1901), No. 12, pp. 818-820*).—On account of the high price of copper sulphate, experiments have been conducted with greatly diluted solutions of Bordeaux mixture and with other fungicides in combating the downy mildew. The author reports upon his experiments made with Bordeaux mixture of strengths varying from 2 per cent down to 0.1 per cent. The results obtained where the vines were sprayed with 0.5, 0.75, and 1 per cent solutions were equal to those where the 2 per cent solution was used. The grapes were well protected against disease, but where weaker strengths were applied there was undoubted infection. The effect of the stronger solutions on the sugar and acid content of the grapes was quite marked, containing much higher percentages than in the case where weaker solutions were used. Experiments are also reported in which zinc sulphate, manganese sulphate, and alum, in combination with lime and soda, were investigated, but these fungicides were all decidedly inferior to Bordeaux mixture. The use of the 3 per cent solution of iron sulphate was tried, and when sprayed twice during July and August the leaves and shoots receiving this mixture were decidedly injured.

Coulure, or non-setting of grapes, E. H. Rainford (*Queensland Agr. Jour., 10 (1902), No. 1, pp. 41, 42, pls. 2*).—This disease, which is known in this country usually by the name of shelling or rattling, is described and is said to occur under two forms—one the failure of the flower to set fruit in any or all parts of the cluster, another in which the fruit sets increase in size for a time, after which they fall off in greater or less quantity. The causes of the disease are said to be accidental and constitutional. The accidental causes are adverse meteorological conditions at flowering time, too great vigor of vegetation, and fungus attacks. Each of these causes is described at some length, and brief suggestions given for their prevention so far as means are known.

The American gooseberry mildew in Ireland, E. S. Salmon (*Jour. Roy. Hort. Soc. [London], 26 (1902), No. 4, pp. 778, 779*).—The first outbreak of the gooseberry mildew (*Sphaerotheca mors-uvae*) was reported in 1900, and in the following year the disease appeared in the same locality and proved more destructive than in the previous season. The conditions seemed to indicate that the fungus was becoming somewhat widely distributed throughout Europe, and the author recommends spraying the plants with a potassium sulphid solution at 10-day intervals, beginning as soon as the buds begin to unfold.

Diseases of the tea plant, G. Delacroix (*Jour. Agr. Trop., 2 (1902), No. 9, pp. 67-72*).—A list is given, together with brief descriptions of the principal animal and vegetable parasites which attack the tea plant. Among the insects are various borers, leaf miners, and other leaf-eating insects, scale insects, red spiders, etc. The author also describes attacks of nematodes upon the roots of plants, 2 species (*Tylenchus acutocaudatus* and *Heterodera radicicola*) being described. Among the plant diseases described are the following: Blister blight, due to *Exobasidium vexans;* anthracnose, caused by *Colletotrichum camellia;* gray blight, due to *Pestalozzia guepini;* thread blight, caused by *Stilbum nanum;* and root rot, due to attacks of *Rosellinia radiciperda*. The effect of the alga, *Cephaleuros virescens*, in producing what is known as red rust is described, as well as the attack of a number of undetermined species of mistletoe upon the plant.

The parasites of the tea plant, A. Zimmermann (*Centbl. Bakt. u. Par., 2. Abt., 8 (1902), Nos. 1, pp. 16-23; 2, pp. 46-55*).—A list is given of animal and plant parasites destructive to the tea plant. Compiled notes are given regarding many species, and a brief bibliography is appended.

Diseases of timber, H. von Schrenk (*Forestry and Irrig., 8 (1902), No. 2, pp. 60–63, figs. 5*).—Notes are given on some of the means by which timber is destroyed, particular attention being paid to the attacks of *Trametes pini*, *Polyporus schweinitzii*, and other species on living coniferous trees. Attention is called to the rapid decay of railway ties, bridge and other construction timbers, and suggestions are offered for the prevention of this destruction by the application of various chemical agents.

The disease of larch, J. Simpson (*Gard. Chron., 3. ser., 31 (1902), Nos. 798, pp. 238, 239; 799, pp. 256, 257*).—On account of the proposed investigation into the larch disease in England, the author calls attention to some of the more important facts relating to it. The distribution of the disease throughout Great Britain is indicated, and attention called to the difference between the larch blister or blight, which is due to species of aphis, and the disease of larches caused by attacks of the fungus *Peziza willkomii*.

A disease of the American ash, H. von Schrenk (*Abs. in Science, n. ser., 15 (1902), No. 376, p. 406*).—Mention is made of a disease of the common ash (*Fraxinus americana*) which is caused by attacks of *Polyporus fraxineus*. Where this disease is prevalent it is said that a large percentage of the trees are affected.

Carnation anthracnose, M. C. Cooke (*Gard. Chron., 3. ser., 31 (1902), No. 795, pp. 193, 194*).—A description is given of a disease that has recently appeared among the carnations in England, in which the leaves are first spotted with small purple roundish spots. These gradually enlarge and become confluent and indeterminate, and at length brownish in the center. In the meantime the leaves become weakened and begin to die at the tip. The general character of the disease is that commonly described as an anthracnose, and the author has described the fungus causing it as a new species to which the name *Glœosporium dianthi* is given. The technical characters of the fungus are mentioned and it is believed that dilute Bordeaux mixture, together with the picking off and destroying of the diseased leaves, would prevent its spread.

Sterilized soil for carnation stem rot, W. R. Pierson (*Gardening, 10 (1902), No. 228, pp. 179–181*).—A report is given of investigations made by the author and others on the prevention of stem rot, which is due to *Rhizoctonia* sp. The soil of benches in which carnations were grown was sterilized by steam heat. The expense of sterilizing the soil in a house 16 by 300 ft. was about $25. In the sterilized soil only about half a dozen plants were lost out of 1,500 planted. This loss is so slight that it is believed the difficulty was overcome. While not claiming that sterilization is a cure for stem rot, the author thinks that, if properly managed, it will secure the prevention of attack. In addition to destroying the fungus, nematodes and other troublesome pests will be likewise eradicated.

Fungus pests of the carnation family, M. C. Cooke (*Jour. Roy. Hort. Soc. [London], 26 (1902), No. 4, pp. 649–656, pls. 2*).—A summary and list is given of the parasitic fungi which attack the carnation family of plants. They are divided into the leaf-spotting fungi, molds, smuts, rusts, and the bacterial diseases. The fungi causing each of these diseases are described at some length, and a list is given of all the parasites known to occur upon species of Caryophyllaceæ, whether cultivated or uncultivated. The total number of species reported is 60.

Observations on the bacterial rot of the calla lily, C. O. Townsend (*Abs. in Science, n. ser., 15 (1902), No. 376, pp. 404, 405*).—A bacterial rot of the calla lily is briefly described, which is characterized as a soft brown rot with offensive odor that usually attacks the bulbs, but may appear on the roots or leaves. It is reported as having destroyed all the plants in greenhouses in the vicinity of Washington, D. C. As a rule, the bulb shows the disease most frequently near the top, but it often happens that the attack is made below the surface of the ground, in which case the bulb is almost entirely destroyed before the leaves indicate that the plant is diseased. Cultures made from diseased areas usually give pure cultures of a rod-shaped motile bacteria. The action of the organism in various nutrient media is briefly described.

Diseased plants have been treated with lime, sulphur, and dilute formalin with some success. The best treatment thus far found, however, consists of changing the soil in the beds or in growing the plants in pots, and in the proper management of greenhouses.

The toxic properties of some copper compounds with special reference to Bordeaux mixture, J. F. Clark (*Bot. Gaz., 33 (1902), No. 1, pp. 26–48, figs. 7*).—Studies are reported on the toxic effect of a number of copper compounds in preventing the growth of fungus spores, etc. Based upon his investigations, the author concludes that the solution of that part of the Bordeaux mixture which under orchard conditions is of fungicidal value is chiefly accomplished by the solvent action of the fungus spores themselves. The amount of copper necessary for the destruction of the spores of parasitic fungi is probably not more than 1 part of soluble metallic copper to 80,000 parts of water. The host plant has a greater or a less power of dissolving copper hydroxid deposited on its leaves. This solution of copper by the host plant may or may not be advantageous in protecting it from attack, as spores may not be present at the point where the solution has taken place. To this factor, however, must be attributed much of the injury frequently observed on such plants as peach, Japanese plum, etc. The amount of injury done to a given species, provided always that carefully prepared Bordeaux mixture is used, will depend on the specific susceptibility of the protoplasm of the plant to poisoning by copper, the solvent properties of the cell sap on copper hydroxid, the permeability of the epidermis or cuticle, and the weather conditions following spraying, particularly the conditions of moisture.

ENTOMOLOGY.

Some insects of the year 1899-1900, C. Fowler (*California Sta. Rpt. 1899–1901, pt. 1, pp. 73–85, figs. 10*).—Biological and economic notes are given on a number of scale insects, including San José scale, black scale, red scale, purple scale, greedy scale, cottony cushion scale, etc. The report also contains brief accounts of injuries from peach-tree borer (*Sannina pacifica*), peach-twig borer, cucumber beetle, squash bug, harlequin cabbage bug, pear slug, and plum-tree aphis.

Phorbia lupini is reported as boring in the stems of white lupines and causing the destruction of these plants. The eggs are laid in the growing top of the plant, or sometimes in the axil of the leaf. The larva then penetrates into the pith of the stem for a short distance. Other species of lupines are attacked as well as the white species. The Lawson cypress is said to have been considerably injured by the bark beetle (*Phlœosinus punctatus*). Affected trees first show an unhealthy appearance, and later turn brown and die. The galleries of the beetle are found under the bark. A species of Andricus was found injuring the English oak. The wasp did not produce galls like most related species, but when the larva was full grown it gnawed its way through the twigs and escaped. In combating this species, severe pruning and cutting back are recommended.

Notes are given on the woolly aphis, which injures not only the roots and trunks of apple trees, but is reported as penetrating into the apples, in the case of Newtown pippins. When the species appears above ground it may be readily destroyed with kerosene emulsion.

Brief notes are also presented on nematode worms, Paris green, kerosene emulsion, resin, soap, and lime-sulphur-and-salt wash.

Some insects of the year 1901, R. H. Pettit (*Michigan Sta. Bul. 200, pp. 179–212, figs. 21*).—*Lecanium armeniacum* is reported as injurious to apricot, plum, and grape. The greatest damage was done in the northern part of the State. Scale insects closely resembling this species were also observed on maple, elm, and hackberry. The natural enemies of the species include parasitic insects, and a fungus disease (*Cordyceps clavulata*). For combating the scale insects the author recommends spraying with kerosene emulsion and whale-oil soap. *Lecanium nigrofasciatum* caused considerable injury to peaches. The species is said to be easily controlled by the use of winter washings. For destroying the young, applications of kerosene emulsion in June and the early part of July are recommended. A larger species of Lecanium is reported as injuring peaches and is described in detail. It is parasitized by *Blastothrix longipennis*, and may be controlled by winter applications of kerosene emulsion. English-walnut scale is said to have been quite injurious to peach and maple. It may be controlled by the remedies which are usually applied against San José scale.

Dactylopius trifolii was found in considerable numbers on sugar beets. The beets which were most infected with the insect were stunted, but it was not clear whether this effect was due to the insects or to other causes. Serious attacks of green aphis are reported as having occurred throughout the State. In some localities the species was greatly checked by the attacks of a parasite (*Aphidius granariaphis*), and syrphus flies. Kerosene emulsion will destroy the aphis, but the feasibility of this method in grain fields is much doubted. The destructive pea louse caused considerable damage in various parts of the State. In some places it attacks sweet peas. Spraying with kerosene emulsion or a mixture of kerosene, and the brush and cultivator method are recommended for controlling this species. Notes are given on experiments in combating spring and fall cankerworms. All of the caterpillars were apparently destroyed by two applications of Paris green. Good results were also obtained from the use of bands.

Basswood trees were attacked by *Hibernia tiliaria* and *Phigalia strigataria*. These insects may be controlled by the same remedies as were recommended for cankerworms. Great damage was caused to onions in a few localities by *Chætopsis ænea*. The maggots of this species pass the winter inside of the onions. The species appears to be many brooded. The author recommends the destruction of all of the infested onions in the fall, and the use of deterrents, such as carbolic-acid emulsion, kerosene and sand, and tobacco dust. Notes are given on the plum gouger, and in combating this insect the following remedies are recommended: Jarring the trees, destruction of fallen and infested fruits, and repeated spraying with Paris green.

An attack of *Epicauta vittata* was reported upon potatoes. Spraying with Paris green is recommended, or while the insect is present in large numbers it is believed that they may be driven away by brushing.

Insect record for 1901, C. M. Weed (*New Hampshire Sta. Bul. 90, pp. 29–44, figs. 12*).—Brief notes are given on the occurrence of injuries from the following insects: *Bibio albipennis*, squash bug, squash-vine borer, striped cucumber beetle, apple-leaf hopper, cankerworm, bean weevil, elm-leaf aphis, birch-leaf skeletonizer, fall webworm, white-marked tussock moth, imported elm-leaf beetle, oyster-shell bark-louse, brown tail moth, and gypsy moth. The imported elm-leaf beetle is said to have established itself in the northern part of the State. The brown tail moth was once found in the southeastern part of the State, but it is believed to have been temporarily exterminated.

Report of the entomologist, E. D. Sanderson (*Delaware Sta. Rpt. 1901, pp. 127–199, pls. 6, figs. 16*).—The author presents an elaborate account of the plant lice which affect apple trees. An analytical key is given for the identification of each species, and detailed notes are given on the life history, habits, and means of combating the different species. These include *Aphis pomi*, *A. fitchii*, *A. sorbi*, and *A. brevis* (the last-named species being described as new). Tables are presented showing the measurements of various parts of the body of the different species, and bibliographical references are given in connection with the discussion of each species. A number of experiments were tried in the use of insecticides for destroying apple plant lice. Crude petroleum was found to be much more effective than kerosene and gave satisfactory results in a 15 per cent solution, while kerosene had to be used in a 20 per cent solution. The most effective spray, however, was Rose Leaf tobacco extract, which was found quite satisfactory when diluted in a proportion of 1 to 40 in water. It proved to be impossible to destroy all the plant lice on a tree by one application of any insecticide.

Experiments in combating strawberry root louse showed that 0.2 gm. of cyanid of potash per cubic foot was not sufficient to destroy the lice in a period of 20 minutes. It was found that plants could be fumigated with this strength of gas for 45 minutes, or less, without injury. Whale-oil soap and Rose Leaf insecticide seriously injured the plants in some experiments, but weaker solutions proved harmless.

Notes are given on *Euzophera semifuneralis*. The species is reported as injurious to plums, apples, pears, and other fruit trees. A description is given, together with notes on its life history. It appears that there are two, or perhaps three, broods in Delaware. Notes on the destructive pea louse include an account of spraying and brushing, and the effectiveness and cost of these methods. The species was quite abundant in Delaware during the year and opportunity was had for experiments with the Brakeley sprayer, and other devices. The author believes that so long as the vines are still upright, any machine which will spray 2 or 4 rows at a time will be found satisfactory.

A number of experiments were made in testing remedies for combating the codling moth. During these experiments it appeared that the codling moth had 1 brood and only a partial second in central Delaware. Spraying experiments in combating the codling moth included the use of arsenid of lime, Paris green, and Disparene. These experiments were supplemented by banding tests. Arsenid of lime did not give very satisfactory results. With Paris green 61 per cent of benefit was observed, while with Disparene the benefit amounted to 87 per cent. On account of the dangers and practical difficulties of manufacturing arsenate of lead on the ordinary farm estate, it is recommended that the insecticide be bought in a prepared form. The results of experiments in the use of bands indicated that about 15 per cent of the codling moths were captured by this device. A combination of Bordeaux mixture with an arsenite and kerosene was successfully used for a number of purposes. A combined insecticide and fungicide was used against codling moth and plant louse with good success. Crude petroleum was tested in mechanical mixtures with water in strengths of 15, 20, and 25 per cent. All San José scales were killed by the 25 per cent solution, while some remained alive after spraying with weaker solution. Fumigation of low growing plants, such as melons, with hydrocyanic-acid gas proved possible and practicable. The author tested the use of paper covers and iron frame covers in these experiments. The results obtained indicate that the effectiveness of the gas depends upon its thorough diffusion, and that treatment can not be effective if not properly diffused.

The resisting power of insects, C. Sterne (*Prometheus, 12 (1901), No. 610, pp. 602–605, figs. 4*).—Notes on the resisting power of different species of insects to cold, heat, hunger, poisons, and submergence in water.

The principal insects injurious to tobacco in the Island of Réunion, E. Bordage (*Rev. Agr. Réunion, 8 (1902), No. 3, pp. 103–112*).—In this article the author gives biological and economic notes on a number of insects which attack tobacco in the island of Réunion. The more important species are *Gelechia solanella*, bollworm, suck fly, and cigarette beetle.

The sugar-cane borer, H. Maxwell-Lefroy (*West Indian Bul., 3 (1902), No. 1, pp. 88–90*).—The life history of *Sphenophorus sericeus* is summarized as follows: The eggs are laid singly in the tissue of sugar cane, and the grub, after hatching, burrows in the cane, destroying almost the whole interior. The remedies which are recommended for controlling this insect include the destruction of all rotten or infested cane, the covering of all rattoon stumps with mold as soon as the canes are cut in order to prevent the deposition of eggs in such locations, and the destruction of rattoon stumps which are not intended to be grown.

The natural enemy of the sugar-cane beetle in Queensland, W. W. FROGGATT (*Agr. Gaz. New South Wales, 13 (1902), No. 1, pp. 63–68, pl. 1*).—Notes are given on the habits and life history of a parasitic wasp, *Scolia formosa*, which was found to be a valuable parasite for holding in check the cane beetle in Queensland. The notes are based largely on the report of Mr. J. T. Clarke, who worked out a part of the life history of the parasite in the laboratory of a sugar refining company. The author also gives notes on the habits and life history of *Lepidoderma albohirtum* and *Xylotrupes australicus*, both of which are injurious to sugar cane in New South Wales.

A parasite of sugar-cane beetle grubs, H. TRYON (*Queensland Agr. Jour., 10 (1902), No. 2, pp. 133–140, pl. 1*).—A hymenopterous parasite (*Dielis formosus*) is reported as being quite effective in checking the numbers of the sugar-cane borer. Notes are given on the distribution of the species, and the insect is described in detail in all its stages. In the discussion of the habits and life history of the insect it is stated that the eggs are probably deposited upon the larva of the cane borer when the latter has nearly reached its full size. It is suggested that the parasite in question may be artificially reared in such numbers as to permit its shipment to the United States and other countries where the cane borer is injurious.

The chinch bug, J. M. STEDMAN (*Missouri Sta. Bul. 51, pp. 115–142, figs. 4*).—In this bulletin a general popular account is given of the habits, life history, food plants, migrations, and means of combating the chinch bug. The different stages of the insect are described, and notes are given on its habits of hibernation, and natural enemies. The birds mentioned as most beneficial in destroying chinch bugs are quail, prairie chicken, meadow lark, red-wing blackbird, catbird, and thrushes. It is believed by the author that little help can be expected from parasitic fungi in destroying the chinch bug. His experience in Missouri indicates that the disease occurs naturally in most badly infested localities, and that the small amount of fungus which can be distributed by any one farmer has little effect on the general result.

The squash bug, C. M. WEED and A. F. CONRADI (*New Hampshire Sta. Bul. 89, pp. 13–28, figs. 2*).—The authors give a popular account of the habits, life history, and methods of attack of this insect. The most important parasitic enemy of the squash bug noted in New Hampshire during the past season was *Trichopoda pennipes*. It is believed that toads seldom feed upon the squash bug for the reason that the odor of the insect has been found to be fatal to toads as well as to a species of salamander. A number of squash bugs were found which apparently had died of an unidentified fungus disease. The remedies recommended by the authors include the use of netting covers when the plants are young, sowing an excessive quantity of seed, clean culture, hand picking, and spraying with a mechanical mixture of kerosene in water. The beetles may be collected from the vines and upon the ground in the spring, as well as from board traps and trap squash plants. In summer similar remedies may be applied, and also spraying with a mechanical mixture of kerosene and water weak enough to be harmless to the squash plants. In the autumn the squash plants may be sprayed with a stronger mixture of kerosene immediately after the first frost.

Experiments with insecticides for the San José scale, S. A. FORBES (*Illinois Sta. Buls. 71 and 72, pp. 241–268*).—In the fall of 1901 the author secured an appropriation of $15,000 for insecticide work on the San José scale. It was decided to make experiments to determine the value of the lime, salt, and sulphur wash and also the lime, sulphur, and blue vitriol wash which is much used in Oregon. It was found that both of these washes had the effect of loosening the scales so that they were easily rubbed off and washed away by rain. The chief purpose of the experiments was to determine the effect of rains which might occur soon after spraying with these washes. The experiments included the artificial application of water to a part of the trees after they had been treated with the wash. As a general result of the experiments it was found that a single application of the lime, salt, and sulphur wash caused the destruction of 90.6 per cent of the scales when no water was applied to the trees within 5 days after spraying and 86 per cent when water was used. The effectiveness of the lime, sulphur, and blue vitriol wash was 93 per cent and 92.2 per cent, respectively. During these experiments 43 trees were treated, 25 being apple and 18 peach trees.

Detailed descriptive and tabulated notes are given showing the time of treatment of the trees and the effect of the treatment upon the scales found on each tree. At the time of year when the experiments were made rain storms naturally occurred. One experiment was made under a tent, the artificial application of water being strictly controlled by placing a tent over the tree at night and at the approach of rain storms. Two trees were treated in this manner, one being sprayed with the lime, salt, and sulphur wash and the other with the Oregon wash containing blue vitriol. In this experiment no important differences were noted in the action of the insecticides, the general effect being the destruction of about 95 per cent of the scales. The results of the experiments, as observed on March 25 or 20 and 22 days after the application of the wash, indicated that the Oregon wash of lime, sulphur, and blue vitriol is a valuable insecticide for use in Illinois for the destruction of San José scale. It appears from these experiments that frequent short rains do not noticeably diminish or delay its action, even when they occur within a period of five days after the application of the wash. Both of the insecticides are harmless to trees, but should be used in winter. At the date mentioned it appeared that the California wash of lime, salt, and sulphur was somewhat less effective than the Oregon wash.

When the trees were examined on May 12, however, a careful count of the scales found upon the trees showed that there were very few living scales. Of 9,000 scales carefully examined only 35 were found living. One-half of the trees on which these statistics were based were sprayed with the California wash and the other half with the Oregon wash. It appears, therefore, that the two insecticides are about equally effective. The action of the washes is apparently prolonged to a period of 3 weeks or more. The chief differences between the two washes are considered to be in the rapidity of action rather than in the ultimate effect on the scales.

A scale insect infesting the fig tree, and its enemies, Trabut (*Bul. Agr. Algérie et Tunisie, 8 (1902), No. 7, pp. 161–167, figs. 9*).—An account is given of the habits and life history of *Ceroplastes rusci*. This bark louse may, under certain conditions, almost completely cover the branches, fruits and leaves of the fig tree. Ordinarily, however, it is held in check by its numerous enemies, among which special mention is made of several species of ladybirds and parasitic insects.

The grapevine and Cœpophagus echinopus, S. Jourdain (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 5, p. 316*).—The author believes that the disease of grapevines attributed to this mite is not thus produced. The mite was frequently found on tubercles, roots, and bulbs which had commenced to decompose; it was not believed, however, to have made the original attack upon these tissues. It is stated that this mite does not attack healthy vines, but only such as are more or less injured by unfavorable conditions in the environment.

The destruction of grapevines by the mite Cœpophagus echinopus, L. Mangin and P. Viala (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 4, pp. 251–253; Bul. Agr. Algérie et Tunisie, 8 (1902), No. 4, pp. 107–109*).—The observations of the authors, extending over several years, indicate that grapevines are not usually attacked by this mite while they are in perfect health. When, however, the soil is only slightly permeable, compact, and moist, and the root system poorly developed, the mites attack the plants, causing disease or death of the vines. A considerable variation in the resisting power of different varieties to the attacks of the mites was noted. Submersion of infested areas had no good effect; on the other hand, it appeared to aggravate the trouble. Sulphocarbonate of potash proved to be ineffective. The only good remedy found was carbon bisulphid applied at the rate of 300 kg. per hectare in a single treatment, or better, in two treatments of 200 kg. each. The parasite was completely eradicated by this method.

Trap lanterns, or "moth-catchers," M. V. Slingerland (*New York Cornell Sta. Bul. 202, pp. 197–225, figs. 2*).—In a general discussion of the utility of trap lanterns it is argued that more importance should be ascribed to the kind of insects caught by such traps than to the numbers. It is well known that many beneficial insects are attracted to the light and killed along with the injurious ones. Two series of experiments were conducted at the station for the purpose of testing the value of lantern traps. One series of experiments was made with these lantern traps in 1889, and the other with one such trap, in 1892. The lantern traps in both series consisted of an ordinary lantern set on a brick in a tin pan, the whole being fastened to a platform on the top of a stake. In the series of experiments in 1889 the trap lanterns were set under various surroundings, such as the edge of a small hop field, under a tree, at the edge of an oat field, in a wheat plat, and in the center of an experimental garden containing bush fruits and some larger trees. It was necessary to visit the traps twice a day, and the six lanterns in the season of 1889 were kept in order every night from May 1 to October 15. The single trap utilized in 1892 was run from May 20 to October 1. Detailed notes are given in a tabular form concerning the number and species of insects captured during these experiments. In 1892 about 13,000 insects were taken, representing 350 species. Of this number 77 per cent were neutral with regard to their effect upon agriculture, while $10\frac{3}{5}$ per cent were decidedly beneficial, and $12\frac{3}{4}$ per cent were insects which are sometimes pests. No codling moths were captured. Among the serious insect pests represented, a much larger percentage of males was captured than females, the percentage of males in different species varying from 79 to 93. This indicates that lantern traps are of little value, in so far as largely male insects are attracted to the light, while females are still left to deposit their eggs. The majority of the insects were taken in June and August. In case of several species, sharply defined periods of flight were observed, during which large numbers of insects were captured. At other times these species might be almost entirely missing in the captures of the night.

The results obtained in various other stations in experiments with moth-catchers and trap lanterns are briefly discussed. Since only about 1 per cent of the insects caught by the author could be considered as common orchard pests, it is urged that the lantern traps have little to recommend them to the ordinary fruit growers. In case of a few insects, like the moths of tent caterpillars, which fly for a few nights only and then in large numbers, it may be possible to use lantern traps to advantage. So many beneficial insects, however, are captured by the traps that the very slight benefits to be derived do not pay for the trouble of maintaining the lantern traps.

Suggestions for insect control in the West Indies, H. Maxwell-Lefroy (*West Indian Bul., 2 (1902), No. 4, pp. 318–344*).—This article contains a general account of the problems of economic entomology, the local condition of the West Indies with reference to injurious insects, and a general classification of methods for controlling injurious species of insects. These methods include legislative measures for preventing introduction of new pests, the adoption of other methods of prevention, remedial measures, encouragement of useful birds and other enemies of insects, and the introduction of new insectivorous birds and predaceous insects.

Circular to nurserymen relating to shipment of nursery stock, W. B. Alwood (*Virginia Sta. Spec. Bul., May, 1902, pp. 6*).—This circular contains information for nurserymen and other persons concerning the requirements in a certificate of inspection and the regulations according to which the crop-pest law will be enforced.

The salt-marsh mosquito (Culex sollicitans), J. B. Smith (*New Jersey Stas. Spec. Bul. T, pp. 10, figs. 2*).—The author gives brief notes on the habits and life history of this species of mosquito, which is considered one of the worst pests along the coast line. This species breeds in salt or brackish water, or occasionally in fresh water fields on salt marshes. The author never observed the species breeding in inland fresh water. The life history of this species of mosquito is not well understood. It probably passes the winter in the egg stage. The remedies which are suggested for mitigating the mosquito plague include the drainage of pools of stagnant water, and application of kerosene to small areas where this method would be more convenient than drainage. One peculiarity of the salt-marsh mosquito is noted, and consists in its habit of drifting with the wind to great distances from its breeding grounds. It may at times, therefore, cause annoyance in localities where no stagnant ponds are found.

The maggot fly, C. Fuller (*Agr. Jour. Cape Good Hope, 20 (1902), No. 2, pp. 102–105*).—This is a brief account reprinted from the *Natal Agricultural Journal* concerning the attacks of *Auchmeromyia depressa* upon dogs and man. Notes are given on the appearance of the insect in its different stages and upon its life history and habits. It is somewhat common in various parts of South Africa.

The distance apart at which apiaries should be placed, De Soignie (*Jour. Soc. Cent. Agr., Belg., 49 (1902), No. 6, pp. 267, 268*).—The author discusses the various legal regulations which have been made for determining the localities for placing apiaries, the distance from public dwellings and thoroughfares, and various other devices which are to be adopted in preventing apiaries from causing annoyance to the public.

The relationship of honey to wax, C. P. Dadant (*Rev. Internat. Apicult., 24 (1902), No. 4, pp. 68–71*).—A general discussion is presented on the question of the expensiveness of the manufacture of wax by bees. The author believes that the production of wax from honey by the bees is too expensive and should not be permitted to occur. Foundations of greater or less size will prevent to a large extent the use of honey for the manufacture of wax.

Do bees injure fruit? (*Queensland Agr. Jour., 10 (1902), No. 2, pp. 107, 108*).—A brief discussion of possible injury to grapes by honeybees. It is urged that the mouth parts of bees are well adapted to biting fruits, but that according to common experience they rarely cause any damage of this sort.

Sericulture, J. Bolle (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 3, pp. 475–480*).—Experiments were made in crossing different races of silkworms for the purpose of determining whether larger cocoons, with silk more easily reeled, could be produced. For a considerable length of time the results in crossing races were unsatisfactory; many undesirable characters which belonged to the different races reappeared from time to time in the crosses. Even when the desired characters were produced, they seemed to be obtained at the expense of the vitality of the silkworms. After a long series of experiments some results were obtained which indicate the possibility of improving the character of the silk and the size of the cocoon without losing the vigor of the worms at the same time. It is recommended that until improved races shall show themselves as being constant in character it would be best to continue with the old well-known races.

The author made some experiments with micro-organisms which were found in the alimentary tract of silkworms infected with flaccidity. It was found possible to inoculate healthy silkworms with organisms which were obtained from infected worms, but it is not considered that the causal connection of these organisms with the disease has been definitely proved. In localities where jaundice of silkworms appears in an endemic form it was found possible to disinfect the premises by fumigation or by spraying with formalin. The treatment was very effective and not expensive.

Experiments were made to determine the feeding value of *Scorzonera hispanica* for silkworms. The results were unfavorable to this plant. Many of the worms became sick, and it is recommended that no attempt be made to use the plant for feeding silkworms.

Sericulture in Tunis, F. Verry (*Bul. Agr. Algérie et Tunisie, 8 (1902), No. 6, pp. 140–150*).—The author gives an account of the local conditions in Tunis which are favorable to the raising of silkworms and the production of silk. A large number of mulberry trees are already planted and it is believed that silk mills will be established as soon as the production of cocoons is sufficiently great to warrant it.

FOODS—NUTRITION.

Human food investigations, H. Snyder (*Minnesota Sta. Bul. 74, pp. 109–174, figs. 21*).—The investigations reported include studies of the digestibility and nutritive value of beans, oleomargarine, butter, cheese, oatmeal, bread made from different grades of flour, and toast, as well as studies of the digestive power of enzyms of milk. The natural digestion experiments were made with healthy men; the artificial digestion experiments were made by the usual laboratory methods. On an average, baked beans eaten with a simple mixed diet had the following coefficient of digestibility: Dry matter, 90.91; protein, 80.22; fat, 79.82, and carbohydrates, 96.19 per cent. It was found that the greatest degree of digestibility was secured when the beans were consumed in a mixed ration. The digestibility of beans with the skins removed by parboiling and the use of soda, beans parboiled with soda and the skins not removed, beans baked without parboiling and without the use of soda, was studied with pepsin-pancreatin solutions.

"When the skins of the beans were removed the beans were more readily acted upon by digestive solvents, as pepsin, diastase, and pancreatin. In 12 hours 25 per cent more of the protein nutrient was digested when the skins of the beans were removed than when the beans were baked in a similar way without the removal of the skins."

In connection with the above tests, the effect of adding soda to the water in which beans were parboiled, the removal of the skins, and related topics were studied. The bean skins were found to have the following percentage composition: Protein, 10.67; fat, 2.10; crude fiber, 39.55; nitrogen free extract, 40.95; ash, 6.73. A number of the author's conclusions were in effect, as follows:

When soda was used in the preparation of the beans it was found that 84 per cent of the soda remained in chemical combination with the proteid material, and 16 per cent remained in the water in which the beans were parboiled. Less than 0.66 of 1 per cent of the total nitrogen of beans was lost in the water used in parboiling, while 99.33 per cent of the total protein remained in the beans.

"When the skins of beans were removed by parboiling in water containing a little soda about 6.5 per cent of the total dry matter of the beans was removed in the skins. The skins contained a large amount of crude fiber and a relatively small amount of protein; about 3 per cent of the total protein in the beans was removed in the skins.

"When the skins of beans were removed there was less tendency for the formation of gas in the intestines during digestion. A small amount of germ adhered to and was removed with the skins; the germ and skin are the parts of the beans which are the most fermentable and produce sulphurretted gaseous products during digestion. . . .

"The nutrients in beans are different in character from the same class of nutrients in cereal foods. The protein in beans is mainly in the form of legumin, while that in the cereals is in the form of glutens. Bean-starch granules are larger in size and differ in microscopic structure from the cereal-starch granules. Beans contain only a small amount of ether extract, a portion of which is in the form of lecithin and free fatty acids. The ether extract from beans, however, has about the same caloric or heat-producing power [which was on an average found to be 9.4 calories per gram] as the ether extract from other foods.

"In these experiments, over a pound of baked beans was consumed per day by men engaged, part of the time, in active outdoor work. It is believed, however, that not more than 4 oz. of uncooked beans or 6 oz. of baked beans should be consumed in the daily ration. While beans are slow of digestion, they can not be considered as indigestible when the availability or total amount of nutrients actually utilized by the body is considered. In these experiments, over 90 per cent of the dry matter in the beans was digested and utilized by the body."

In a study of the comparative digestibility of oleomargarine and butter as part of an otherwise uniform ration, it was found that the average digestibility of the latter ration was protein, 89.66; fat, 95.54; and carbohydrates, 96.97 per cent; available energy, 92.06 per cent. The digestibility of the ration with oleomargarine was protein, 87.90; fat, 94.20; and carbohydrates, 97.01 per cent; available energy, 91.30 per cent.

Several experiments were undertaken in which a considerable amount of cheese was eaten. Only one of these was satisfactorily completed. It was found in this case that cheese consumed with a bread and milk ration had the following coefficient of digestibility: Protein, 93.36; fat, 94.5, while the availabile energy was 92.59 per cent. When samples of Minnesota, Wisconsin, and New York cheese were subjected to the pepsin and pancreatin digestion processes it was found that from 47.4 to 52.9 per cent of the total protein, namely, casein, was digested and rendered soluble by the action of the peptic ferments (in acid solution), and that from 44 to 49.2 per cent of the remaining protein was dissolved in the alkaline pancreatin solution.

"The digestion with pepsin and pancreatin solutions show that a large part of the work is carried on by the pancreatin solution. If the peptones present in the cheese were deducted it would be found that the larger part of the work of digestion takes place in the alkaline pancreatin solution. These artificial digestion trials emphasize the fact that the main portion of the work of digestion of cheese is carried on in the intestines rather than in the stomach. This is probably the reason why cheese is characterized as a 'hearty food' and frequently causes digestion troubles when eaten. In such cases the amount of cheese consumed should be reduced to correspond with the digestive capacity of the individual. Cheese should be consumed in small amounts, and by so doing the digestive powers of an individual can be strengthened and not impaired."

Two experiments on the comparative digestibility of bread and toast are reported. On an average, 87.1 per cent protein and 97.5 per cent carbohydrates of the bread were digested, as compared with 84.7 per cent protein and 97.3 per cent carbohydrates of toast. The comparative digestibility of bread and toast was also studied with diastase ferments. When 10 gm. of sterilized dry toast was treated for 45 minutes with a dilute solution of malt, 14.68 per cent of starch was rendered digestible. Under the same circumstances 21.38 per cent of the starch of toast was rendered digestible. According to the author, the experiments show that toast is more readily acted upon by a diastase ferment than bread, and that by toasting a food is produced which is more readily though not quite as completely digested as bread. This, in the author's opinion, does not detract from the value of toast as a food for invalids and others requiring a sterilized food product, but indicates that, as far as the digestibility of nutrients is concerned, bread is preferable to toast.

"Toast is a sterile food while some breads contain various ferment bodies which have not been destroyed in baking, as the interior of the loaf is not heated above the boiling point of water. The ferment and fungus bodies present in unclean flour undergo incubation during the process of digestion, particularly if the digestion is in any way impaired. In the case of normal digestion, however, these bodies do not develop to any appreciable extent because the digestive tract disinfects itself. Microscopic examination of the feces, particularly of those when the diet consisted of graham or entire wheat breads, showed that these fungus bodies had undergone the incubation process during digestion. The patent grades of flour produced by the roller process of milling contain less of these ferment bodies than either graham or entire-wheat flour. This is because the bran and germ parts of wheat which are included in the graham and entire wheat flours are the parts which contain the ferment bodies. . . .

"In case it is necessary to use a sterilized food, as toast, in the dietary it is more economical to prepare it at home from flour of good quality than it is to purchase it in the form of so-called health foods. . . .

"It would appear that the prolonged action of heat in the preparation of foods lessens the digestibility of the protein but not of the carbohydrates. The two classes of nutrients in foods, proteids and carbohydrates, are evidently affected in a different way, as far as the total digestibility is concerned, the carbohydrates being made more easy to digest and the proteids less completely digestible by the prolonged action of heat. Since in many of our foods, particularly the grains, the carbohydrates are by far the most abundant class of nutrients, the action of heat in their preparation has a favorable influence in making food more easy of digestion rather than affecting the completeness of the process.

"A study of the results of two series of digestion experiments with man showed that when milk formed a part of the ration the nutrients, especially protein, are more completely digested than when no milk is consumed. According to the author:

"When milk was used in a ration, with bread, butter, beans, eggs, and potatoes, all of the protein of the milk was digested, and in addition 4.91 per cent more of the protein of the other foods with which it was combined was digested than when the milk was omitted."

This suggested that the enzyms present in milk might assist in the digestion of other foods, therefore the author studied the digestive power of milk by treating samples of toast weighing 10 gm. with 10 cc. of milk and 90 cc. of water for 2 hours at a temperature of 98.5°. It was found that on an average 12.25 per cent of the total protein of the bread present was digested. When pasteurized milk was used, 7.6 per cent of the protein was digested. On account of the coagulation of the albumen, the author states that experiments could not be made with sterilized milk. "The soluble ferments of milk evidently exert a material influence as digestive agents, and fresh milk is a digestive fluid, as well as a food of high nutritive value."

The experiments on the digestibility of oatmeal and the comparative digestibility of bread made from flour from different grades have been noted from another publication (E. S. R., 13, p. 370).

Report on a standard emergency ration, M. E. Jaffa (*California Sta. Rpt. 1899–1901, pt. 1, pp. 54–56*).—A healthy young man (one of the California University students) lived for 5 days on an emergency ration which is marketed in the form of tablets. He lost weight, and in other ways, according to the author, showed a condition of lowered vitality. The conclusion is drawn that the ration did not supply sufficient nourishment. The composition of the ration is reported. In the author's opinion, protein and nitrogen-free nutrients were not present in the proper proportion, while the total nutrients furnished were lower than the commonly accepted dietary standard calls for.

The diet of native laborers, J. M. ORPEN (*Salisbury, Rhodesia: Argus Printing and Publishing Company, Ltd., 1902, pp. 12*).—In this paper, presented before the Salisbury branch of the Rhodesia Scientific Association, the author discusses food and diet with especial reference to native laborers. He calls particular attention to the extended use of fermented foods and beverages by them, and believes that such materials serve a useful purpose.

Hygiene of food and digestion, H. STAEDTLER (*Hygiene der Nahrungsmittel und der Verdauung. Leipzig: F. Leineweber, 1902, pp. 103*).—Diseases of the digestive system due to errors in diet are discussed, as well as food as a remedial agent in such diseases, and related topics.

The effect of fineness of division and of cooking food upon its digestibility, K. B. LEHMANN, F. MEYER and M. GÖTZ (*Arch. Hyg., 43 (1902), No. 2, pp. 123–133, figs. 2*).—The comparative digestibility of coarsely and finely divided cooked egg white, meat and cheese, and of coarsely and finely divided vegetable foods, including coarse bread, peas, vegetables, macaroni, etc., was tested by methods of artificial digestion. In some cases the vegetable foods were raw and in others they were cooked. Generally speaking, the digestibility increased with the fineness of division, and the authors believe that the importance of thorough mastication has been generally underestimated rather than overestimated. The increased digestibility due to cooking the vegetable foods was also very marked. Coarse food, such as graham bread, which is not finely divided by chewing, the authors believe from their experiments would remain a long time in the stomach and would be digested slowly. This would account for the feeling of satiety observed for a considerable time after such food is consumed, and on account of which the nutritive value of coarse food has been often overestimated.

Testing the baking quality of flour, G. BARTH (*Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 10, pp. 449–457, fig. 1*).—The value of a special apparatus (which is described) for determining the baking quality of flour was tested, and different sorts of flour were compared. The apparatus was not regarded as sufficiently accurate. The author points out that estimating the amount of gluten and the amount of water which it will absorb furnishes a means of judging the quality of flour. The glassy appearance of wheat is also an indication of the baking quality, the two things being directly proportional.

A study of the banana and its future possibilities, G. C. NUTTALL (*Longman's Mag., 1902, No. 232, pp. 320–325*).—The author discusses the food value of bananas and banana flour, and calls attention to the fact that green bananas, banana shoots, and the starchy pith of the stalk are used as vegetables. The article contains the erroneous statements so frequently made regarding the high food value of the banana, which are evidently based on a comparison of the composition of the dry matter of the banana and the fresh material of flour and potatoes.

Concerning the toxic and injurious properties of certain coal-tar colors, G. W. CHLOPIN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 6, pp. 242–245*).—The author was the subject of some of the tests reported; others were made with a dog. The conclusion was drawn that metanil yellow, in doses of 0.2 gm. in the case of a man, and from 2 to 3 gm. daily in the case of a dog, was not poisonous, and therefore may perhaps be regarded as a harmless coloring matter. Mandarin (orange II), according to the experiments, must be regarded as poisonous.

Inspection and analyses of foods, M. A. SCOVELL and R. M. ALLEN (*Kentucky Sta. Bul. 100, pp. 83–147*).—The State pure-food law is quoted, as well as the improved form of food guaranty, and details are given of the samples analyzed under the State pure-food law during the year. The following table, which summarizes the work, shows that the percentage of adulteration was high:

Summary of analysis under pure-food law.

	Not found adulterated.	Adulterated.	Total.
Baking powder	5	36	41
Canned goods	12		12
Butter	116	5	121
Jellies, preserves, etc	8	7	15
Milks (sweet and butter)	300	30	330
Minced meats	2	9	11
Oleomargarine		62	62
Olive oil and lard	13	1	14
Tomato catsup, sauces	3	50	53
Sirups, sugar, honey	15		15
Soda-fountain drinks	43	26	69
Feeding stuffs	4	1	5
Total number found adulterated			227
Total number not found adulterated			521
Total number of samples analyzed			748

The use of the serum diagnosis in the examination of foods, G. von Rigler (*Oesterr. Chem. Ztg., 5 (1902), No. 5, pp. 97–100*).—Taking advantage of the fact that after inoculation for a time with the blood of a given species of animal, the blood of the inoculated animal gives a characteristic reaction with the blood used for inoculation, the author studied the possibility of identifying by these means different sorts of flesh foods and different kinds of sugar. The results obtained are not regarded as definite. The author believes, however, that the method is worthy of the attention of physiological chemists.

Serum agglutination and its value for the examination of meat, Miessner and Herbst (*Arch. Wiss. u. Prakt. Thierh., 1902, No. 3–4; abs. in Ztschr. Fleisch u. Milchhyg., 12 (1902), No. 8, pp. 241, 242*).—The authors concluded from their investigations that the serum agglutination method furnishes a simple and accurate means of detecting mixtures of beef with horse or dog flesh.

A new method of preserving eggs (*Bul. Soc. Vaud. Agr. et Vit. [Lausanne], 1902, No. 151, pp. 28, 29*).—The method described consists in immersing the eggs for a quarter of an hour in water of 35° C., then immersing them in boiling water for 5 seconds, and storing in wood ashes, chaff, bran, or sawdust.

ANIMAL PRODUCTION.

Preliminary report on steamed silage, J. Withycombe and A. L. Knisely (*Oregon Sta. Bul. 72, pp. 187–201, figs. 2*).—Silos were filled with corn fodder in the usual way and immediately treated with steam for some time. The steamed silage kept well. Its chemical composition was studied, as well as that of silage treated with salt, with and without the addition of water, and silage which had received no special treatment. Since the work is regarded as of a preliminary nature, no definite conclusions are drawn, but the authors regard the practice of steaming silage as promising.

Concerning the keeping qualities and properties of peat-molasses feeds, A. Herzfeld, O. Schrefeld, and K. Stiepel (*Ztschr. Ver. Deut. Zuckerind, 1902, No. 554, II, pp. 207–217*).—From experiments which are reported in detail, the following conclusions are drawn. A water content of over 25 per cent does not lower the keeping qualities of peat-molasses mixtures. Long-continued heating at a high temperature causes an increase in the invert sugar content, but does not lower the keeping qualities. The invert sugar is formed only in acid peat molasses, and may be best prevented by using alkaline molasses. The peat possesses some antiseptic properties since peat-molasses mixtures ferment more slowly than molasses solutions. Owing to the fact that peat absorbs materials other than sugar, peat-molasses mixtures have a higher purity quotient and a better flavor than molasses itself.

Experiments on the changes induced by micro-organisms in feeding stuffs and food. I. The changes induced by molds in feeding stuffs rich in fat, A. Spieckermann and W. Bremer (*Landw. Jahrb., 31 (1902), No. 1, pp. 81-128, pls. 2*).—Noted from another publication (E. S. R., 13, p. 581).

Concerning the changes which micro-organisms induce in feeding stuffs and foods on storing, J. König (*Landw. Vers. Stat., 57 (1902), No. 1-2, pp. 71-85*).—Noted from another publication (E. S. R., 13, p. 581).

The rôle of sugar in nutrition, L. Grandeau (*Jour. Agr. Prat., n. ser., 4 (1902), No. 28, pp. 37, 38*).—A discussion of the value of sugar as part of the ration of farm animals.

Food value of pie melons, M. E. Jaffa (*California Sta. Rpt. 1899-1901, pt. 1, pp. 52-54*).—Analyses are reported of the flesh and rind, and seeds of the pie melon. The feeding value of the pie melon is briefly discussed and compared with that of other succulent feeds.

Foods, feeding stuffs, and fertilizers, M. E. Jaffa (*California Sta. Rpt. 1899-1901, pt. 1, p. 51*).—Brief statements concerning the analyses made at the station of foods and food materials, dairy products, and fertilizers.

Analyses of concentrated commercial feeding stuffs made in connection with the State inspection, H. J. Wheeler and A. W. Bosworth (*Rhode Island Sta. Bul. 84, pp. 168-176*).—The materials analyzed include cotton-seed meal, gluten meal of different brands, linseed meal (old and new process), gluten feed, cereal breakfast food by-products, hominy, hominy meal, hominy chop, mixed commercial feeds, barley sprouts, middlings, beef scrap, and animal meal.

Licensed concentrated feeding stuffs, F. W. Woll and A. Vivian (*Wisconsin Sta. Bul. 92, pp. 12-20*).—The State feeding stuff law is quoted, and data showing the amount of protein and fat guaranteed by the manufacturers in a number of feeding stuffs on sale in the State are given.

Experiments in wintering and fattening steers, H. J. Waters (*Bul. Missouri State Bd. Agr., 1 (1901), No. 6, pp. 14-26*).—Tests on the comparative merits for winter feeding of steers of different sorts of coarse fodder, the value of balanced rations, and feeding in barns, sheds, and open lots are briefly reported. In the first trial on the comparative merits of different sorts of coarse fodder, timothy hay, cowpea hay, and corn fodder and clover hay in nearly equal amounts, were compared with 3 lots of 4 steers each, in a test beginning in December and covering 119 days. In every case corn was fed with the coarse fodders. The average daily gain per steer on timothy hay ration was 1.69 lbs.; on the cowpea hay ration, 2.64 lbs.; and on the clover hay and corn fodder ration 1.94, the grain required per pound of gain being 11.51, 8.31, and 11.29 lbs., respectively.

In the second test timothy hay, clover hay, cowpea hay, clover and corn fodder, and clover and wheat straw were compared with 5 lots of 4 steers each, in a test beginning in January and covering 105 days, corn being fed with the coarse fodder as before. The average daily gain per steer in the 5 lots was 1.97, 2.84, 2.84, 2.85, and 2.68 lbs., respectively, the corresponding amount of grain eaten per pound of gain being 11.19, 8.69, 8.65, 8.30, and 9.21 lbs., respectively.

The author notes that the addition of clover hay or cowpea hay to the ration induced better and cheaper gains. He says in effect that the steers consuming these hays have always carried to market far more finish, a much better coat, a finer bloom, and would readily have outsold any other lot in these experiments. Even when the coarse fodder was a mixture of corn fodder or wheat straw, with either clover or cowpea hay, the effect on the appearance of the steers was quite as marked as upon gain in weight.

The value of a properly balanced ration was studied with 4 lots of 4 steers each, in a test beginning in December and covering 104 days. Lots 1, 2, and 3 were fed 6 lbs. per head daily of corn with timothy hay, clover hay and corn fodder, and cowpea hay, respectively, in addition. Lot 4 was fed cowpea hay only. On these rations there was an average daily gain of 0.64, 0.88, 1.54, and 0.56 lb., respectively. In a second test covering 80 days, made under similar circumstances, the coarse fodders compared were timothy hay, clover hay, millet hay, sorghum hay, and clover and corn fodder, 6 lbs. of corn per head daily being consumed in each case in addition to coarse fodder. The average daily gain per steer in the 5 lots was 1.00, 2.00, 0.37, 0.52, and 1.35 lbs., respectively. The author calls attention to the fact that the use of leguminous hay to balance the ration was very satisfactory.

Four tests on the effect of shelter on the gains made by steers fed heavy rations in winter are reported. In every case the lots compared were fed similar rations of corn and hay. In the first test the average daily gain of steers fed in barns was 1.47; of those fed in sheds, 1.72 lbs. In the second trial corresponding gains were 1.85 and 2.3, while similar gains made by steers fed in an open lot were 2.29 lbs. In the third test steers in barns gained on an average 1.67 per head daily; those fed in open sheds 1.69; and those fed in open lots 1.78. In the fourth test the corresponding values were 1.83, 1.97, and 2.09 lbs. The author calls attention to the fact that better gains were made by the steers fed in sheds and open lots than by those fed in barns, a result which was not expected. Inquiries bearing upon the subject were sent to a large number of feeders; over half of those who replied favored feeding in open sheds, some 18 per cent favored feeding in barns, and some 23 per cent feeding in open lots. As will be seen, the experience of practical feeders, as shown by these figures, was in accord with the results of the tests.

Feeding problem this winter, H. J. Waters (*Bul. Missouri State Bd. Agr., 1 (1901), No. 7, pp. 16–34, figs. 3*).—Winter feeding and the comparative value of different feeding stuffs are discussed and a number of feeding tests with cattle are quoted. On the basis of the data the author suggests rations which he believes will prove satisfactory. Tests on the comparative value of timothy hay, corn fodder (whole, shredded, and ensiled) are also reported, which covered in every case about 3 months and were made with steers weighing about 900 lbs. each. In no case was grain fed with the coarse fodder. The data reported include the results of one test with shredded corn fodder fed with clover hay, two with shredded corn fodder and with ensiled corn fodder, and three with timothy hay and whole corn fodder.

On an average 20.2 lbs. of timothy hay was eaten per head daily, the total gain being 30.7 lbs. The average amount of whole corn fodder eaten was 25.8, and on an average there was no gain or loss. On an average 20.6 lbs. of shredded corn fodder per head daily was eaten, and there was an average loss of 11.6 lbs. On ensiled corn fodder the average amount eaten was 58.4 lbs., the average gain 44 lbs. Similar values for the shredded corn fodder and clover hay ration were 25.2 lbs. and 58.4 lbs. The author notes that satisfactory results were obtained with ensiled corn fodder and with the shredded corn fodder and clover hay ration. A number of his other conclusions follow:

"It is clearly shown that yearling steers may be carried through the winter with practically no loss in weight and in some cases with a little gain on nothing but whole corn fodder. With good timothy hay such cattle will make a small gain. . . . From these trials it is perhaps safe to estimate that timothy hay is worth fully twice as much as whole corn fodder pound for pound for wintering young cattle. . . .

"When whole fodder and shreded fodder are compared the difference is surprisingly small, and instead of the shredding process having increased the feeding value it seems to have diminished it. . . .

"Shredding fodder undoubtedly relieves the farmer of some very disagreeable work in hauling the coarse stalks in bad weather, overcomes the necessity of digging the material out of the snow in winter, and makes it possible to feed the material in the barn and use the portion refused by the stock for bedding. The manure may be handled much more conveniently, and in short the greatest drudgery of winter feeding is removed.

"On the other hand the farmer with the regular force he would probably keep in any case can handle the fodder crop without additional cost or outlay if it be fed whole, whereas if it be shredded or siloed the work is concentrated into a few days and much extra labor must be hired for the purpose. This is the chief argument against shredding, especially since the results of the experiments already quoted fail to show an increased feeding value due to the process. . . .

"Unquestionably the siloing process increases the palatability of the material, [and] greatly reduces the waste by inducing the stock to eat practically all of the stalk. Herein lies the chief advantage of silage, for experiments have clearly shown that the material is not more fully digested after it has been made into silage than if well cured and fed dry.

"Finally it seems safe to say that corn fodder is too cheap in the ordinary year and likely to be too cheap in the great corn belt for many years to come to warrant the expenditure of much money in increasing its feeding value. The investment of this extra money in cutting more fodder will likely pay better than putting it on the amount that is now ordinarily cut."

Steer feeding, H. T. French (*Idaho Sta. Bul. 32, pp. 71-76*).—To learn something of the possibility of feeding steers economically in stalls, a test covering 56 days was made with three lots of 2 animals each. During the first four weeks of the test, lots 1 and 2 were fed chopped wheat, and lot 3 wheat and bran, 2:1. During the following two weeks all the lots were fed bran, chopped rye, and chopped wheat in different proportions. During the last two weeks of the test lot 1 was fed barley and shorts 1:1; lot 2 barley and wheat 1:1; and lot 3 barley and shorts 1:1. In addition to the grain, the steers were fed hay and silage. The average results of the test follow.

Results of steer feeding test.

	Weight at beginning of test.	Average daily gain per head.	Feed eaten per pound of gain.			Cost of feed per pound of gain.
			Grain.	Hay.	Silage.	
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Cents.*
Lot 1	2,170	2.10	4.05	2.51	13.72	4.39
Lot 2	1,830	1.78	3.66	3.71	9.69	4.39
Lot 3	2,000	1.38	6.51	3.26	23.61	7.05

According to the author there was on an average a net profit of $15.13 per steer. "The barley shorts and the barley chopped wheat combinations constitute an excellent grain ration for steers. The chopped rye was not especially well relished by the steers. Chopped wheat alone is a good grain ration when combined with corn silage and hay. The conditions in this locality, so far as affected by climate and food supply, are favorable for stall feeding cattle."

Sheep-feeding experiments, W. J. Kennedy and F. R. Marshall (*Iowa Sta. Bul. 63, pp. 178-185*).—The possibility of profitably fattening sheep under local conditions was studied, two feeding tests being reported. The first had to do with the problem of finishing Western lambs on grass and grains for the early summer market and was carried on with 4 lots of 15 sheep each, and 1 lot of 101. The sheep cost, including freight, 4.25 cts. per pound. All the lots were fed on blue grass pasture. Lot 2 was fed corn, lot 3 oats, lot 4 barley, and lot 5 corn and oats in addition to the pasturage. In the case of the latter lot, the oats were fed only for 30 days of the 60 days during which this lot was studied. The other lots were fed for 63 days.

The sheep in lots 1 to 4, inclusive, weighed a little under 81 lbs. each at the beginning of the trial; those in lot 5 some 75 lbs. each. The average daily gain of the 5 lots was 0.41, 0.46, 0.42, 0.39, and 0.44 lb. The grain consumed per pound of gain in lots 2 to 5 was 1.7, 1.86, 1.99, and 2.05 lbs. The cost of feed per pound of gain in the 5 lots was 1.05, 1.95, 2.36, 2.75, and 2.26 cts., respectively. According to the authors, the test indicates that sheep will make practically as large gains on grass alone as on grain and grass. "Corn at 33 cts. per bushel is a more economical grain to feed sheep on grass than oats at 23 cts. or barley at 40 cts."

"Mutton can be produced much more economically during the summer months on grass alone or grain and grass than it can be produced by feeding grain and hay during the fall and winter months. The feeder can oftentimes purchase half-fat lambs during the latter part of April or the first part of May, and by grazing them for from 40 to 60 days realize a good profit, due to the advance in market prices during the latter part of June and the first of July over those ruling in April and the first part of May."

In the second test the problem of finishing Western wethers for early winter market was studied with 7 lots, special attention being paid to the feeding value of emmer (commonly called speltz). Lots 1 to 4 contained 10 sheep each. There were 15 in lots 5 and 7, and 30 in lot 6. Lots 1 to 4 were fed clover hay, lot 5 grass and rape, and lots 6 and 7 grass. In addition lot 1 was fed emmer, lot 2 soy beans, lot 3 corn and gluten feed 2:1, and lots 4, 5, and 6 corn. All these lots also received a little bran during the first few days of the test. The animals receiving grain were given about ¼ of a pound per head daily at the beginning of the test, which covered 56 days, the amount being increased as the test progressed. The average weight of the sheep in the different lots was not far from 110 lbs. The average daily gain was 0.46, 0.41, 0.45, 0.45, 0.45, 0.41, and 0.28. The grain eaten per pound of gain in lots 1 to 6 was 3.26, 2.29, 3.0, 3.02, 2.41, and 3.01 lbs., respectively, in addition to a little bran. The clover hay eaten by lots 1 to 4 was a little over 4 lbs. per pound of gain. According to the author, the data obtained indicated that for sheep-feeding purposes when corn is worth 40 cts., emmer is worth 26½ cts. per bushel of 35 lbs. When corn is worth 40 cts., soy beans, if they compose the sole grain ration, are worth but 45 cts. per bushel. Corn alone when fed in conjunction with clover hay produced larger and more economical gains than the ration of corn, gluten feed, and clover hay. Sheep can be fattened more economically on grass and corn or on grass alone than on emmer and clover hay or the other rations tested. "Soy beans on account of their high protein content should not form the sole grain ration in conjunction with clover hay. Pound for pound corn is more valuable than emmer. Mutton can be produced economically on grass alone during the summer months."

Feeding lambs, H. T. French (*Idaho Sta. Bul. 32, pp. 77–86, pls. 4*).—Three feeding tests with lambs are briefly reported. In the first 20 selected grade lambs, averaging 75 lbs. each in weight, were fed 36 days to fit them for the Christmas market. They were kept in a box stall and given 1½ lbs. per head daily of whole wheat and oats, in addition to coarse fodder ad libitum. There was an average daily gain of 0.15 lb., and a calculated profit of 87 cts. per head, not deducting the cost of the coarse fodder. In the second test 59 grade lambs, weighing somewhat less than those used in the first trial, were fed for 103 days a ration of pea hay and clover hay, with some corn silage and roots, in addition to a grain ration of 1.1 lbs. of oats and wheat, 1:2. They were kept in box stalls, but were allowed to run in the yard once a day when they were watered. The average daily gain was 0.2 lb. per head, the grain eaten per pound of gain being 5.36 lbs. The lambs were sold for $21.35 more than they originally cost, plus the cost of the grain eaten.

The comparative merits of grade Shropshire and Oxford down lambs were tested in the third trial with two lots, one containing 10 lambs of the former breed and the other 10 of the latter. All the lambs were kept in pens and feed for 16 weeks a grain ration consisting of whole oats and wheat, 2:1, in addition to clover hay, a mixture of pea hay and wild oats, and mangel-wurzels and carrots mixed. During the last 4 weeks they were also given some corn silage. At the beginning of the trial the average weights of the lambs in the two lots were 75 and 70 lbs., respectively. During the test the average daily gains were 0.24 and 0.20 lb., respectively. Considering the test as a whole, the cost of a pound of gain was 6.1 cts. It was calculated that there was a total profit of $1.08. Five lambs in each lot were slaughtered; the dressed weight being on an average 52.3 per cent of the live weight.

"There was no profit in feeding the lambs under the conditions prevailing in this experiment, except such as would result from feeding the coarse products of the farm instead of selling them off the farm. We believe it is better to feed lambs than to sell them for mutton in the fall, where more favorable conditions for feeding can be obtained. If lambs are fed in winter in this section, they should have an open, dry shed in which to run a portion of the time. An open yard with no roof will not do for sheep here on account of the mud. It will pay, where more exercise can be given, to feed a heavier grain ration, and make the feeding period shorter.

"While the results in this experiment are somewhat negative, yet they will serve as a guide for further work, and we shall repeat the work under other conditions and at other seasons of the year."

The author also reports analysis of chopped rye. shorts, barley, millet seed, corn silage, and pea hay.

The food value of sugar beet, A. D. Hall (*Jour. Southeast. Agr. Col., Wye, 1902, No. 11, pp. 100–103*).—Using two lots of 13 sheep each, the comparative value of mangel-wurzels and sugar beets was tested for 8 weeks. In addition to the roots, each sheep received per head per day a pound of a mixture of oats, maize, and linseed cake. All the animals were folded on grass land and frequently shifted to secure satisfactory pasturage. The average weight of the sheep fed mangel-wurzels at the beginning of the trial was 123 lbs.; of those fed sugar beets 122 lbs. The average increase of the two lots was 30 and 22 lbs., respectively. According to the author the wool of the sheep fed mangel-wurzels was superior to that of the other lot. The conclusion is drawn that sugar beets can not profitably replace mangel-wurzels as a fodder crop for sheep.

A comparison of feeds for pigs, D. W. May (*Kentucky Sta. Bul. 101, pp. 152–164*).—The comparative merits of feeding corn alone and combined with other materials were tested with five lots, each containing 4 Berkshire grade pigs. Lot 1 was fed shelled corn alone; lot 2, shelled corn and corn and soy bean silage; lot 3, shelled corn and shelled soy beans, 2:1; lot 4, shelled corn and dried distillery grains, 1:1, and lot 5, shelled corn and dried distillery grains, 2:1. The pigs weighed on an average about 140 lbs. each at the beginning of the trial. In the ten weeks of the test the average daily gain in the different lots was 0.70, 0.87, 1.16, 1, and 0.63 lbs., respectively. At the conclusion of the test proper the feeding was continued for a supplementary period of 3 weeks. During the first week all the pigs were fed shelled corn and skim milk, those in lots 1 and 4 receiving ¼ lb. of cotton-seed meal per head daily in addition. During the second week all the pigs were fed hominy meal and tankage, those in lots 2 and 3 receiving ¼ lb. and those in lot 5 ½ lb. of cotton-seed meal per head daily. During the third week the basal ration again consisted of shelled corn and tankage, the pigs in lot 1 receiving in addition ¼ lb. and those in lot 4 ½ lb. of cotton-seed meal per head daily. The average daily gain without cotton-seed meal was 1.4 lbs. and with cotton-seed meal, 1.62 lbs. On the former ration 3.95 lbs. of feed and on the latter 3.47 lbs. was required per pound of gain. The author's conclusions follow:

"The results of these experiments, like those of several previously made, indicate that in feeding pigs corn should be combined with other feeds to get the best returns. Experiments indicate that silage can not be profitably substituted for a part of the grain ration with pigs. In this experiment it was fed in addition with some profit, giving quicker gains and keeping the animals in better condition.

"Soy beans made an excellent pig feed mixed with corn in the proportion of 1:2. Being rich in protein it is recommended as an especially efficient addition to the ration when corn composes the larger part. Dried distillery grains proved to be a poor pig feed except in small proportions. When fed as ⅓ or ½ of the ration with corn it was unprofitable. Where it composed ⅕ of the ration very good returns were obtained. Cotton-seed meal may be profitably used to finish hogs for market. In such cases it may be safely fed in quantities of ½ lb. per pig daily and then omitted during periods of alternate weeks.

Analyses are reported of the shelled corn, dried distillery grains, soy beans, corn and soy bean silage, and hominy meal used in the above test.

Growing swine of various breeds and crosses, T. SHAW (*Minnesota Sta. Bul. 73, pp. 73–108, figs. 21*).—In the first of two tests of the comparative gains made by different breeds and crosses of pigs, the following were represented: Pure-bred Poland Chinas, Poland Chinas (corn-fed), pure-bred Tamworths, large improved Yorkshires, cross-bred Tamworth-Poland Chinas, large improved Yorkshire-Poland Chinas, second cross large improved Yorkshire-Berkshires, third cross large improved Yorkshire-Berkshires, 3 pigs of each breed constituting a lot in every case except the cross-bred Tamworth-Poland Chinas, when only two were used. Beginning when they were 10 weeks old the pigs were fed for 28 weeks skimmed milk, ground grain, and during the season some green feed (rape, corn, and mangel-wurzels). The grain consisted of shorts and corn 3:1, shorts, corn, and barley 2:1:1, and corn and barley 1:1, on an average 3.43 lbs. of grain being consumed per head daily. Considering the ration as a whole, meal constituted a little over 70, skimmed milk a little over 9.5, and green feed a little less than 20.5 per cent. At the beginning of the test the pigs weighed on an average 44.12 lbs., and the average daily gain was 0.89 lb. per head. The greatest gains (131 and 128 lbs. respectively) were made by the second cross Yorkshire-Berkshires and the Yorkshire-Poland Chinas, and the least gain (84 lbs. and 88 lbs. respectively) by the corn-fed Poland Chinas and the Poland Chinas fed the same ration as the majority of the lots. Gain was most economically made by the Tamworths and the large improved Yorkshires, costing, respectively, 2.01 and 2.02 cts. per pound; the most expensive gains, costing 2.52 cts. per pound, were made by the pure-bred Poland Chinas.

The second test was made under the same conditions as the first. The breeds and crosses represented were as follows: Pure-bred Tamworths, large improved Yorkshires and Poland Chinas, cross-bred, large improved Yorkshire-Berkshires, large improved Yorkshire-Poland Chinas, large improved Yorkshire-Poland Chinas (Minnesota bred dam), Tamworth-Poland Chinas, and third cross large improved Yorkshire-Berkshires. At the beginning of the test the weight was 48.38 lbs. each on an average. The average gain was 1.11 lbs. per head daily. The greatest gain (166 lbs.) was made by the Yorkshire-Poland Chinas, and the least gain (119 lbs.) by the pure-bred Tamworths. The range in the cost of a pound of gain was from 2.11 cts. in the case of the Yorkshires to 2.48 cts. in the case of the pure-bred Poland Chinas. Some of the conclusions drawn from the tests as a whole follow:

"These experiments do not sustain the view that the results will be less satisfactory from each succeeding cross of Yorkshire on Berkshire. Swine of the lard-producing types are not more cheaply grown up to the age of 196 days than swine of the bacon-producing types. Pork can be made more cheaply from swine of the large improved Yorkshire and Tamworth breeds than from the Poland Chinas or what may be termed the lard types. The cross of the large improved Yorkshire and Tamworth breeds upon the Poland China sows of the corn-reared types produces animals at once vigorous, shapely, 'growthy,' and relatively more profitable than pigs from the aforementioned sows. During the two years covered by the experiment pork was produced with six lots of pigs with various blood lines subsequent to the weaning period at an average cost for food 2.24 cents per pound."

Molasses as a food for army horses, G. E. Griffin (*Twentieth Century Farmer, 1902, No. 69, p. 2*).—The feeding value of molasses was tested with 8 army horses in Porto Rico, this material being fed with chopped grass, in accordance with the local custom. The molasses ration was gradually substituted for the usual ration of oats and hay until the animals were fed on an average 35 lbs. of grass and 14 lbs. of molasses per head daily. "The molasses was diluted with 25 per cent of water and mixed with the chopped grass as far as possible; where all could not be mixed it was dissolved in water and offered as a drink, which was partaken of during the night out of the bucket left in each manger." The molasses ration was continued for some 5 months. At first all the horses lost weight, but after a time gained in weight from 35 to 68 lbs. The average cost of the grass and molasses ration was 15 cts. per day, and that of the hay and oat ration 27 cts. Favorable results were also observed when molasses and grass were fed instead of the ordinary ration to several horses which were out of condition.

From his tests, the author concludes that 35 lbs. of grass and 13 to 15 lbs. of molasses daily per 1,000 lbs. live weight is sufficient to maintain a horse in good working condition in a climate like that of Porto Rico. Upon this ration the animals tested did more work than on the usual ration, while their condition and coat improved; there was less tendency to perspiration, the wind decidedly improved, the urine increased slightly. A tendency to constipation was observed but was readily overcome by feeding bran. Sudden changes from the dry ration to the molasses ration did not prove injurious, nor did they cause digestive derangement. A change from the molasses ration to ordinary dry ration should be made gradually. The disadvantages noted were as follows: "Molasses attracts insects, notably flies and ants; it sticks to the animal's coat, smears his face and breast, halter and halter strap, soils the clothing and equipment of the men, and causes some trouble and delay in mixing it with the grass, which must be cut fine."

Poultry feeding, H. J. Wheeler (*Rhode Island Sta. Bul. 84, pp. 155–167*).—The principles of poultry feeding are discussed.

Plump v. shrunken wheat as food for laying hens, M. E. Jaffa (*California Sta. Rpt. 1899–1901, pt. 1, pp. 56, 57*).—Analyses are reported of shrunken and plump wheat. On account of its high protein content the author believes the shrunken would prove satisfactory as a food for laying hens.

DAIRY FARMING—DAIRYING.

Soiling crop experiments, C. B. Lane (*New Jersey Stas. Bul. 158, pp. 18, pls. 4*).—This bulletin summarizes the results of experiments during 6 years in regard to providing a uniform supply of succulent food for dairy cows from May 1 to November 1. Data obtained each year have been published from time to time in the reports of the station. The value of different crops for this purpose is discussed and methods of culture are given. Alfalfa is considered the most promising crop. During 5 years the herd averaged 21 cows and was fed soiling crops for 6 months and silage for 6 months each year. On soiling crops the average production per cow was 3,423 lbs. of milk and 172.7 lbs. of butter, and on silage 3,050 lbs. of milk and 157.4 lbs. of butter.

Cost of raising heifers, A. T. NEALE (*Delaware Sta. Rpt. 1901, pp. 28–30*).—The results of tests indicate that under Delaware conditions $40 to $45 barely covers the cost of raising heifers to the age of 25 to 30 months. A special study is to be made of this subject.

A new method of milking, J. J. HEGELUND (*Ber. Landökon. Konsulentvirk., 1900, pp. 31–39*).—The method of milking originated by the author and described by him in this report in outline, has created great interest of late in Scandinavian dairy circles. The main point of the method consists in following up the regular milking by a system of manipulations of the udder which will remove all the milk remaining in the cavities and ducts of the udder at the time of the milking. The ordinary method of stripping fails to remove this portion, which is doubly valuable on account of its high fat content. The author does not give any data in this report as to the increase in yield of milk obtained by the new method, but others have stated it to be from about 1 to 3 lbs. a day per head. The following synopsis of the method of milking recommended by the author will explain its essential features:

The milking is done with dry hands and with the whole hand, the two fore teats being milked first. The milking is begun by lifting the hands alternately with a pressure against the udder, the teats being held loosely with the hands. When considerable milk has come down, each hand is lowered until the teat has its natural length, without being stretched. As the hand is lowered the teat is pressed from above downward with a gradually increasing pressure, and a continuous stream of milk is thus pressed out of the teat. At first the milking is done slowly, taking care that the teat is not stretched; stretching will cause the cow to hold up her milk. When the milk flows readily, the milking is proceeded with as rapidly as the milker can possibly do it, until but very little milk is obtained. Interrupting the milking from the time the milk flows freely until the udder is emptied must be guarded against. As soon as a good flow of milk comes, the pressure against the udder mentioned above may be omitted. When only a thin stream of milk is obtained by this manipulation, the hand is again opened above, and while the lower fingers loosely hold the teats, thus remaining at the place most convenient for pressing the milk out of the teats, the hand is pressed against the udder, or its lower part is grasped so as to more easily secure a full stream of milk. When the fore teats do not give more milk, the hind teats are handled in the same way, but without beginning with the pressure against the udder.

The hind teats being emptied, the "clean milking" is begun. The fore teats are again grasped and the hands lifted to around the lower part of the fore quarters, taking hold of this, thumb on one side and the other fingers on the other. The milk is pressed into the milk cistern by means of a light pressure, and from there out of the teat, emptying the fore quarters. In milking the hind quarters the hand grasps with each grip well up around the hind part of the quarters.

An "after-milking" now takes place, which is conducted in three different manipulations in the following manner: *First manipulation:* The right quarters are pressed against each other (if the udder is very large only one-quarter is taken at a time), with the left hand on the hind quarter and the right hand in front on the fore quarter. The hands are now pressed toward each other, while the milker at the same time lifts them toward the body of the cow. This pressing and lifting is repeated three times, the milk collected in the milk cistern is then milked out, and the manipulation repeated until no more milk is obtained, when the left glands are treated in the same way. *Second manipulation:* The glands are pressed together from the outside. The fore quarters are milked, each by itself, by placing a hand, with fingers spread, on each side of the quarter; the hands are pressed against each other and the teats then milked. When no more milk is obtained by this manipulation the hind quarters are milked by placing a hand on the outside of each quarter, likewise with fingers spread and turned upward, but with the thumb just in front of the hind quarter. The hands are lifted and grasp into the gland from behind and from the side, after which they are lowered to draw the milk. The manipulation is repeated until no more milk is obtained. *Third manipulation:* The fore teats are grasped with partly closed hands and are lifted with a push up toward the body of the cow, both at the same time, by which method the glands are pressed between the hands and the body. The milk is drawn after each three pushes. When the fore teats are emptied the hind teats are milked in the same manner. The milking is then finished.—F. W. WOLL.

The new method of milking, C. SÖNDERGAARD (*Den ny malkemetode. Odense, Denmark, 1901, pp. 63, figs. 13*).—The book describes the new method of milking cows introduced in Denmark within the last two years by two Danish agricultural teachers, Hegelund and the author. The methods advocated by the two men differ somewhat, but are based upon the same principle, namely, to secure the most thorough milking by means of careful stripping, preceded by certain manipulations of the udder which will bring down the last traces of milk secreted at the time of milking. According to the author, the extra manipulations of the udder will bring an increase in the quantity of milk drawn of 1 lb. per head per day, or about 300 lbs. per cow annually. Reports in the Scandinavian agricultural and dairy press are on the whole very enthusiastic as to the value of the new method of milking and generally more than bear out the claims for increased yields brought about by its introduction in dairy herds.[a] The book contains a popular description of the udder, the process of milk secretion, and the new method of milking, with half-tone reproductions of photographs showing the various steps in the manipulation of the udder. Discussions of udder and milk diseases, drying off before calving, milking two or three times a day, and brief suggestions as to the general care of dairy cows are also given in the book, making it a complete treatise on the subject of milk production.—F. W. WOLL.

The Hegelund method of milking, J. O. AASHAMAR (*Norsk Landmandsbl., 20* (*1901*), *No. 43, pp. 529–531*).

Report on the churnability of cream, trials carried out at the society's show at Croydon, May, 1901, E. MATHEWS (*Jour. Bath and West and Southern Counties Soc.* [*England*], *4. ser., 12* (*1901–1902*), *pp. 107–119*).—The milk used in the trials here reported was obtained from Shorthorn, Jersey, Guernsey, and Kerry cows and separated under identical conditions. Sweet cream from morning's milk and ripened cream from evening's milk were churned at 54, 58, and 62° F. and also at 54° with the addition of water at 75° when the butter was on the point of coming. Of the estimated amount of butter in the milk the percentages obtained from unripened cream for the different breeds were as follows: Shorthorn 40.9, Jersey 85.7, Guernsey 47, and Kerry 57.1. The corresponding percentages obtained from ripened cream were 82.9, 96.5, 88.5, and 83.9. The results show a much greater loss from churning sweet cream as compared with cream ripened for 36 hours. The yield of butter was increased by the lower temperatures but not by the addition of hot water. With both ripened and unripened cream the Shorthorns showed the greatest loss of butter and the Jerseys the least. The author draws the conclusion that the fat content of milk as shown by chemical analysis is not a reliable guide as to the weight of butter to be obtained.

Payment for milk according to analysis as practiced in Belgium, G. E. LLOYD-BAKER (*Jour. Bath and West and Southern Counties Soc.* [*England*], *4. ser., 12* (*1901–1902*), *pp. 120–125*).—A brief description is given of the method of payment for milk at factories suggested by Baron Peers, in which account is taken not only of the fat content of the milk as determined by the Gerber method, but of the quality of the fat as shown by centrifugal separation with an Alexandra tester. The results of tests of this method by Henseval are also summarized.

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[a] See Norsk Landmandsblad, 1901, pp. 366, 529, 563; Tidsskr. Norske Landbr., 1901, pp. 33, 247; Tidsskr. Landökon., 1901, pp. 88, 219; Ugeskr. Landm., 1900, p. 465.

A note on the fat globules in milk, F. J. Lloyd (*Jour. Bath and West and Southern Counties Soc. [England], 4. ser., 12 (1901–1902), pp. 125–130*).—Measurements of the fat globules in several samples of Jersey milk showed a marked uniformity in size, the vast majority being from 8 to 12 μ in diameter, while very few were less than 4 μ. The majority of the fat globules in Shorthorn milk measured from 6 to 8 μ in diameter, while those measuring 1 to 2 μ were very numerous. The observations tended to show that the presence of exceptionally large fat globules in milk is rare and that the majority of fat globules are uniform in size. Other observations indicated no upward movement of fat globules smaller than 4 μ in diameter in milk which had been allowed to stand for 12 hours. The fat globules in all the samples examined appeared to be distinct, which militates against the theory that the larger globules carry up the smaller ones. The author was unable to detect a covering to fat globules which had taken on a granular form, which led to the conclusion that no such envelop exists.

Stagnant water germs in milk, E. F. Pernot (*Oregon Sta. Bul. 71, pp. 177–184*).—Experiments were conducted to determine if the bacteria commonly found in stagnant water can gain access to the milk supply through the cow. Pure cultures of *Bacillus fluorescens liquefaciens*, *B. janthinus*, and *B. ramosus* were in turn added to the drinking water and given to a cow every morning for periods of 10 days each. In no case were the bacilli added found on plate cultures made from the milk each morning and evening. *B. ramosus* was administered in cultures containing spores in abundance and was not found in either the milk or excreta. The same cow was then given each morning for 10 days 10 cc. of a bouillon culture of the typhoid bacillus, and for the 5 days following 20 cc. of the culture without apparently affecting the health of the cow. In only 2 cases did typhoid colonies develop on plate cultures made each morning and evening from the milk, urine, and feces, and these were considered accidental inoculations. To determine if the typhoid bacillus can enter the udder through the milk ducts, the teats were immersed in a pure culture directly after milking and allowed to dry spontaneously. Twelve hours later the teats were disinfected, and plate cultures were made from the milk drawn under aseptic precautions. The experiment was repeated for 5 days, the cultures in no instance during the experiments or for a number of days after showing typhoid colonies.

The milk supply of London, R. W. Woosnam (*Dairy, 14 (1902), No. 166, p. 310*).—Until recently the author analyzed over 10,000 samples of milk annually and found that about 25 per cent of the milk sent to London contained less than 3.5 per cent of fat, the average annual composition being 3.6 per cent of fat and 8.8 per cent of solids-not-fat.

Testing milk and cream, F. L. Kent (*Oregon Sta. Bul. 70, pp. 161–176, pl. 1, fig. 1*).—The author makes a number of suggestions in regard to testing milk and cream and reports several experiments. A comparison was made of the small dipper and the Scoville sampling tube in sampling milk. Composite samples of the milk of 52 patrons, varying in amount from 15 to 450 lbs. daily, were taken by the two methods and the results compared with daily tests for the same period, which lasted 15 days. The average of the daily tests for the whole number of patrons was 4.01 per cent. The average of the composite samples taken by the sampling tube was 4 per cent and by the dipper 3.95 per cent.

In sampling cream by the dipper and by the milk thief, the two methods gave the same results in 58 trials, the milk thief higher results in 3 trials, and the dipper higher results in 39 trials. The methods of weighing and measuring cream for the

Babcock test were compared and the adaptability of the composite sample to the testing of cream was investigated with results summarized as follows:

"For all practical purposes, a pipette holding 18 cc. can be used in measuring test samples of sweet cream containing between 18 and 25 per cent fat. If the cream is sour or contains more than 25 per cent fat, the test sample should be weighed.

"Considerable variation will be found in the tests of daily deliveries during a composite test period. A variation of 9 per cent or more may be expected.

"The composite sample can be applied to the testing of cream quite as successfully as in milk testing. Fifty comparisons of composite tests with 'tests from total fat' showed an average difference of but 0.03 of 1 per cent.

"Composite test periods for cream should not exceed 10 days in hot weather. At other seasons of the year semimonthly periods will prove satisfactory."

Testing skim milk by the Babcock test, F. W. WOLL (*Country Gent., 67 (1902), No. 2569, p. 357*).—The limit of accuracy of the Babcock test for separator skim milk is discussed, the author considering that tests of less than 0.05 per cent are suspicious and may be taken as pretty conclusive evidence that the tests were not properly made. Tests made by using about 20 cc. of acid and whirling for 5 minutes in turbine testers or 7 minutes in hand testers show generally 0.10 per cent of fat. "It is a safe rule to go by, to increase readings of separator skim milk tests made by the Babcock test by 0.03 per cent, if these are conducted under the most favorable conditions for the separation of the fat, and by 0.05 per cent in other cases, when too little acid was used or the whirling not continued long enough."

The spontaneous decomposition of milk at 40-44° C. and the micro-organisms concerned, M. FERGUSON (*Inaug. Diss., Göttingen, 1902, pp. 46*).—In this study, carried on under the direction of W. Fleischmann, 50 samples of milk from two dairies (taken each month from May to November) were allowed to sour spontaneously at 40, 42, and 44° C., and then examined bacteriologically. Four forms were noted—two bacteria, a bacillus, and a micrococcus. These were studied at length, and the effect of their growth in milk noted. *Bacterium I* resembled *Bacillus lactis aerogenes*, but did not agree entirely with the description of any forms of the latter. *Bacillus II* agreed almost entirely with the hay bacilli; and *Bacterium III* showed many similarities with the hay bacillus and the tyrothrix species, but did not correspond in all respects with any of them. *Micrococcus IV* showed great similarity to the *Micrococcus acidi paralactici liquefaciens* of Kozai, and is thought to be closely related to it.

The first three forms, I, II, and III, were more numerous and constant. All produced volatile acids principally and only traces of lactic acid. The micrococcus produced somewhat more lactic acid, in association with volatile acids, but was present in smaller numbers and absent in some samples. This leads the author to suggest tentatively that in the spontaneous souring of milk at 40 to 44°, more volatile acids than lactic acid are formed as a rule. The work of others is reviewed.

On the increased resistance of bacteria in milk pasteurized in contact with the air, H. L. RUSSELL and E. G. HASTINGS (*Centbl. Bact. u. Par., 2. Abt., 8 (1902), No. 15–16, pp. 462–469*).—This is a reprint of the author's latest paper on this subject in the Annual Report of the Wisconsin Station (E. S. R., 13, p. 986).

Studies on the causes of rancidity of butter, O. JENSEN (*Centbl. Bakt. u. Par., 2. Abt., 8 (1902), Nos. 1, pp. 11–16; 2, pp. 42–46; 3, pp. 74–80; 4, pp. 107–114; 5, pp. 140–144; 6, pp. 171–174; 7, pp. 211–216; 8, pp. 248–252; 9, pp. 278–281; 10, pp. 309–312; 11, pp. 342–346; 12, pp. 367–369; 13, pp. 406–409*).—This is an extensive investigation of this subject, including a review of the important literature relating to it. According to our present knowledge, the decomposition of fat is of two general kinds, namely, oxidation processes and hydrolytic processes. By the oxidation process the unsaturated fatty acids (i. e., in butter the oleic acid) and in part the glycerids are attacked, as Duclaux and others have shown. The decrease in the iodin absorption number is a convenient means of measuring the progress of this process. By the hydrolytic processes the fats are split up into glycerin and free fatty acids, and accordingly the progress of the process is measured by the amount of free fatty acids, expressed in acid number. It has been shown by numerous investigators that the unpalatability of fat is not always in proportion to the content of free fatty acids, which appears to be due to the fact that only those fatty acids which are volatile or soluble affect the senses. Fats which contain no glycerids of volatile fatty acids can not, like butter, become rancid as the result of hydrolytic cleavage, but only as the result of oxidation.

The author enumerates four possible causes to which rancidity has been assigned, namely, the oxygen or the carbonic acid of the air, the enzyms originally present in the milk, and micro-organisms. These possibilities were each investigated, the action of a long list of micro-organisms being studied.

It is shown that several forms of micro-organisms commonly occurring in butter are capable of decomposing the butter, with the formation of volatile fatty acid and esters. This, the author believes, is sufficient proof that the rancidity of butter may be due to micro-organisms, and that the hypothesis of the action of a milk enzym is very improbable. It is thought very possible, however, that the micro-organisms effect the cleavage of the fat by means of a ferment (steapsin) which they form. The author added to filtered and sterilized butter a quantity of an old milk culture of the organisms to be tested which had been passed through a Chamberland filter. Samples of butter were treated in this way with cultures of *Bacillus fluorescens liquefaciens* and of *Oidium lactis*. These experiments showed that the acid number increased, i. e., that the rancidity progressed, and the author concludes that this was due to enzyms (steapsin).

The author sums up the principal results of his investigations as follows:

The air plays a direct part in the spoiling of butter only when the latter is exposed to sunlight or to a high temperature. The butter is then oxidized and takes on a very disagreeable odor and taste, but is not rancid.

Butter becomes rancid only through the action of certain micro-organisms. As these are all aerobic, rancidity progresses from the surface inward. For the preservation of butter it is, therefore, advisable to seal it up hermetically, or at least to leave as little surface exposed as possible, i. e., to keep it in large pieces rather than in small.

The micro-organisms which under ordinary conditions cause rancidity are *Oidium lactis, Cladosporium butyri, Bacillus fluorencens liquefaciens*, and occasional *Bacillus prodigiosus* also. All of these cleave the butter fat.

The volatile fatty acids are formed at first by the bacteria and later by the two molds working together. By the latter action butyric acid ester is also formed. By means of salt the formation of volatile fatty acids can be reduced, and by means of milk sugar the ester formation checked. Whether or not rancidity can be entirely prevented by the combined action of these two substances has not been determined.

Bacillus fluorencens liquefaciens and *B. prodigiosus* are often introduced into the butter in the water used, the former the more frequently. The *Oidium lactis* and *Cladosporium butyri* are believed to come from the air. The former is always present in the air of creameries in large quantities. In order to make butter which keeps well, therefore, the milk, cream, and butter should come into contact as little as possible with water, and be excluded, so far as possible, from the air. Experiments have shown that the danger of infection through water is materially diminished by ripening the cream, provided actual pure cultures of lactic acid ferments are used, since with an impure starter there is much danger of infection with mold. Pasteurization of the cream at 85° C. destroys all of the micro-organisms injurious to the keeping quality of butter. If the cream is cooled, however, by allowing it to spread out in a thin layer over the cooler under the free access of air, and is then kept in open vessels for a considerable time, it is exposed to infection from the air; and if the butter is washed with unboiled water there is danger of water infection. The whole object of pasteurization can, therefore, be defeated by improper subsequent treatment. Absolute safety requires that the pasteurized cream should be cooled in a closed apparatus with the aid of sterilized air, the cream vat kept well covered, and the butter washed only with boiled water.

Lactic acid ferments and the ripening of cheese, E. von Freudenreich (*Centbl. Bakt. u. Par., 2. Abt., 8 (1902), Nos. 21, pp. 674–681; 22, pp. 705–711; 23, pp. 735–738; Landw. Jahrb. Schweiz, 16 (1902), No. 3, pp. 91–104; Rev. Gén. Lait, 1 (1902), Nos. 13, pp. 289–295; 14, pp. 313–319; 15, pp. 340–346*).—The author sought to obtain decisive proof of the causal relation of lactic acid bacteria to the ripening of cheese. The milk used in the experiments was drawn with thorough aseptic precautions and made into Emmenthaler cheese according to the usual methods. Notwithstanding the care taken the milk was found to contain a maximum of 680 and an average of 230 bacteria per cubic centimeter. At the same time milk drawn without aseptic precautions contained as high as 11,250 bacteria per cubic centimeter. Lactic acid bacteria were almost invariably absent in the freshly drawn milk. Experiments to ascertain the source of the lactic acid bacteria showed their absence in outdoor and laboratory air, spring water, soil, and fecal matter; and their presence in the air of the stable, dust and hair from the cows, and liquid manure. The bacteria regularly met with in the freshly drawn milk were mainly liquefying and nonliquefying micrococci.

In all 35 experimental cheeses were made, each from 14 liters of milk. Hansen's rennet tablets were used in all cases except for cheeses ripened with lactic acid bacteria, when natural rennet rich in lactic acid bacteria was employed. Six cheeses were made without the addition of cultures and were used as controls. The other cheeses were made with the addition of liquefying micrococci, lactic acid bacteria, and *Bacillus nobilis*, either in pure cultures or mixed. The cheeses were judged by a commission and subjected to bacteriological and chemical examination, the results of which are considered by the author as showing that lactic acid bacteria play the principal rôle in the ripening of cheese. The control cheeses did not undergo normal ripening especially as regards flavor. The favorable action of the lactic acid bacteria was most marked when they were added in the form of natural rennet. The liquefying micrococci in the absence of lactic acid bacteria gave the cheese a bitter flavor, but in the presence of lactic acid bacteria their development soon ceased. *B. nobilis* added in pure cultures did not develop in the presence of lactic acid bacteria, which was also the case when Tyrogen alone was used. Pure cultures of *B. nobilis* in the absence of lactic acid bacteria gave the cheese a repulsive odor. Several other experiments are noted briefly, which likewise demonstrate, according to the author, that Tyrogen does not exert the least influence in the ripening of soft cheese.

Investigations on the presence and development of Tyrothrix bacilli in Emmenthaler cheese, Gerda Troili-Petersson (*Landw. Jahrb. Schweiz, 16 (1902), No. 1, pp. 26–32; Ann. Agr. Suisse, 3 (1902), No. 1, pp. 5–12*).—Bacteriological studies here reported led to the conclusion that the number of Tyrothrix bacilli in cheese is insignificant compared with the total number of bacteria or even with the number of other liquefying bacteria present, and that there is no increase in the number of Tyrothrix bacilli in cheese. On the contrary, when pure cultures of *Bacillus nobilis* were used in large quantities the bacilli diminished rapidly during the first two days.

Acid and rennet producing bacteria in milk, C. Gorini (*Landw. Jahrb. Schweiz, 16 (1902), No. 1, pp. 22–25; Centbl. Bakt. u. Par., 2. Abt., 8 (1902), No. 5, pp. 137–140; Ann. Agr. Suisse, 3 (1902), No. 1, pp. 1–4*).—The author's studies indicated the presence in milk of micrococci producing acid and rennet and capable of peptonizing casein in an acid medium.

The duration of the life of the bacillus of tuberculosis in cheese, F. C. Harrison (*Landw. Jahrb. Schweiz, 16 (1902), No. 4, pp. 138–140; Ann. Agr. Suisse, 3 (1902), No. 2, pp. 44–46*).—Experiments with Cheddar cheese made in Canada were carried out in the same manner as those with Emmenthaler and Cheddar cheese made at Berne and previously reported (E. S. R., 12, p. 985). As determined by inoculation experiments with guinea pigs, the tubercle bacilli in the cheese retained their vitality for 62 to 70 days from the time of manufacture, although their virulence was much lessened during the last 20 days of this period. In the Cheddar cheese made at Berne the bacilli remained alive for 104 days. Reasons offered in explanation of this difference are the increased acidity, saltness, and firmness of the Canadian cheese. The author concludes that there need be no fear of ingesting living tubercle bacilli with Cheddar cheese.

Dairying in Australia (*Brisbane: The Brisbane Newspaper Company, Ltd., 1902, pp. 80, figs. 3*).—A reprint of a series of articles on this subject.

Cheese, butter, and condensed milk, factory product, H. E. Alvord (*Twelfth Census United States, Census Bul. 189, pp. 29, figs. 2*).—The statistics given are for the census year ended May 31, 1900, and embrace the operations of establishments engaged in the manufacture of cheese, butter, and condensed milk. From a summary of the statistics of the dairy industry of the United States as a whole the following figures are taken: Total number of cows kept for milk, 18,112,707; total gallons of milk produced, 7,728,583,350; total pounds of butter made, 1,492,699,143; total pounds of cheese made, 299,006,818; aggregate value dairy products of United States, $590,827,154.

VETERINARY SCIENCE AND PRACTICE.

Experimental anæmia. The study of the hemolytic cytase in the plasma of normal animals, C. Levaditi (*Ann. Inst. Pasteur, 16 (1902), No. 4, pp. 233–256, pls. 2*). The author conducted an extensive series of experiments, chiefly on guinea pigs, for the purpose of determining as accurately as possible the effects of hemolytic cytases or sensibilizing substances in the organism of normal animals. It was found that the hemolytic sensibilizing substance when introduced into the peritoneum was rapidly absorbed. It was located chiefly in the organs in which the destruction of the red blood corpuscles normally takes place, especially in the spleen. Some of the substance was found in the kidney and liver but the largest quantities were found in the spleen. As a result of the accumulation of the cytases in the spleen this organ becomes the seat of an active and intense phagocytosis of the red blood corpuscles. The blood plasma is deprived of its hemoglobin and contains a quantity of the cytase. A portion of the red blood corpuscles which float in the plasma fix the cytase, but the larger part of it remains free. Immediately after introducing cytase into the peritoneal cavity it comes in contact with the leucocytes in the peritoneal lymph and the red blood corpuscles which are in this lymph or which are set free by the hemorrhage due to injection. A portion of the cytase is immediately fixed by the leucocytes and red blood corpuscles but the larger part remains free.

Concerning infection from the uninjured conjunctival sac, K. Hirota (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 6, Orig., pp. 225–240*).—A general discussion is given of the possibility of the penetration of the conjunctiva by micro-organisms. The author presents a review of the literature of the subject and a discussion of results obtained by numerous experiments on various experimental animals with different pathogenic organisms. The organisms were in each case placed in the conjunctival sac in a careful manner so as not to injure the conjunctiva in any way. In experiments with anthrax bacillus it was found that 9 out of 10 white mice showed no local alteration of the conjunctiva and only one became infected with anthrax. The same results were obtained with white rats. In guinea pigs and rabbits no infection occurred, or even alteration of the conjunctiva. Anthrax spores were tested in the same manner on white mice, guinea pigs, and rabbits, with negative results in every case. The organisms of mouse septicæmia produced a conjunctivitis and death after 9½ days, in 4 out of 6 white mice upon which the experiments were made. In rabbits this organism caused conjunctivitis but no infection. The organism of fowl cholera produced infection and death in 5 out of 7 white mice upon which experiments were made. Experiments on white rats gave negative results, while 4 out of 7 rabbits became infected. Experiments with swine plague bacillus gave negative results in white mice, white rats, and guinea pigs. The organism of pneumonia caused the death of 4 out of 8 white mice, but did not affect rats, guinea pigs, or rabbits. The author concludes from these experiments that a general infection may be produced by bringing the organisms of mouse septicæmia, fowl cholera, or pneumonia into the uninjured conjunctiva sac, while such infection is quite doubtful in the case of anthrax bacillus. In further experiments, in which the lachrymal canal was closed or destroyed, no infection was produced with any of the organisms in any experimental animals. More or less serious conjunctivitis was produced in many cases, but the infection did not spread. It appears, therefore, that the entrance of the organism into the general system takes place through the lachrymal canal rather than through the conjunctiva.

The influence of the lowest temperatures obtainable with liquid air upon the virulence of pathogenic bacteria, C. M. Belli (*Centbl. Bakt. u. Par., 1. Abt., 31* (*1902*), *No. 8, Orig., pp. 355–360*).—The author conducted experiments in subjecting various pathogenic bacteria to the influence of low temperatures secured by means of liquid air. The temperatures obtained by this means were as low as —200° C. It was found that a temperature of —200° C. for a period of 15 hours had no influence upon the virulence of the anthrax bacilli. Careful counts were made of cultures subjected to these low temperatures and it was found that a number of the less resistant bacteria in each culture were killed by the cold; inoculation experiments, however, showed that the cultures as a whole remained virulent.

Modifications in blood and serum preserved in an aseptic manner, M. Doyon and A. Morel (*Compt. Rend. Acad. Sci. Paris, 134* (*1902*), *No. 10, pp. 621–623*).—It was found by the authors that in the blood of normal dogs and horses selected and preserved in an aseptic manner at a temperature of 37° C. the ether extract and the combined fatty acids diminished in quantity. This diminution of the ethers in the blood is not accompanied with an increase in the acid of the blood; it takes place only in the presence of oxygen and is intimately connected with the red blood corpuscles.

Immunity and protective inoculation, A. T. Kinsley (*Industrialist, 28* (*1902*), *No. 28, pp. 417–422*).—A popular discussion of the general subject of immunity with special reference to the prevention of blackleg, anthrax, hog cholera, and swine plague.

Experiments in the transmission of leprosy to animals, Y. Tashiro (*Centbl. Bakt. u. Par., 1. Abt., 31* (*1902*), *No. 7, Orig., pp. 276–278*).—In the experiments undertaken by the author, rabbits and guinea pigs were used as experimental animals. The tissue from leprous patients was used for making interperitoneal or hypodermic inoculations. It was found that the bacillus maintained itself for a considerable time in the tissue of the inoculated animals, but was ultimately disintegrated so that no permanent infection resulted. It is believed, therefore, that the transmission of leprosy to animals is absolutely impossible.

Morphology and experimental researches on the trypanosoma of nagana or tsetse-fly disease, A. Laveran and F. Mesnil (*Ann. Inst. Pasteur, 16* (*1902*), *No. 1, pp. 1–55, figs. 9*).—A general historical account of this disease is given with numerous references to the literature on the subject. The disease affects a large number of mammals belonging to different families, including the majority of domesticated animals. Man and birds are entirely immune to the disease. The habits and anatomy of the tsetse fly (*Glossina morsitans*) are described, with special reference to the manner of infection in which this insect acts as agent. The authors carried on numerous inoculation experiments with the trypanosoma of this disease on different experimental animals, including rats, mice, guinea pigs, rabbits, and dogs. It was found that when fresh blood containing trypanosoma was injected into the subcutaneous connected tissue, the organisms usually appeared in the blood in from 36 to 48 hours. Mice which were inoculated in the body cavity with virulent blood diluted in 5 times its volume of physiological salt solution showed signs of infection after 2 days and died at the end of 5 days. Virulent blood carefully collected and preserved in glass vessels in contact with the air retained its virulence for at least 3 days. In experiments to determine the influence of cold upon the trypanosoma it was found that this organism could not be preserved so long in a refrigerator as *T. lewisi*. The organism retained its virulence no longer in an ice chest than at the temperature of the room. When the organism was subjected for 3 hours to a temperature of 40° C., or for 1 hour and 20 minutes at a temperature of 42° C., the virulence was destroyed. Detailed notes are given on the morphology of *T. brucei;* its appearance in fresh blood and in stained preparations, the mode of multiplication, and its agglutination are discussed. The organism was differentiated from other closer related species of the same genus. This species became agglutinated in from ½ to 1 hour in blood which was drawn directly from the heart. A detailed account is given of the course and symptoms of the tsetse-fly disease in the various species of mammals which are susceptible to this disease. The characteristics of other diseases caused by other species of trypanosoma are discussed for the purpose of distinguishing them from the tsetse-fly disease. The related diseases are surra, mal de caderas, and dourine.

The tsetse-fly disease, A. Theiler (*Schweiz. Arch. Tierh., 43 (1901), Nos. 3, pp. 97–112; 4, pp. 153–162*).—The greater part of this article is occupied with a critical discussion of the literature relating to this subject. Attention is called to the difficulties of demonstrating the presence of the blood parasite in the blood of affected animals. The blood parasite outside of the animal body lives for periods of different lengths, depending on the medium in which it is cultivated. In defibrinated sterilized blood the organism was maintained in a living condition for 8 days. In some instances the blood parasite is present in such small numbers that the investigator may fail to find a single example, in making tests for this purpose. Where large quantities of blood are examined, however, a few parasites will be found in all cases of the disease. The period of incubation of the disease varies in different species of animals. In horses the minimum was 3 days and in one case the period was 12 days. The duration of the disease in horses varied in the author's experiments from 4 to 22 days. During the progress of tsetse-fly disease a progressive anæmia is observed. The number of red blood corpuscles per cubic millimeter diminished in one case from 5,500,000 to 2,500,000. In sheep the course of the disease occupied from 26 to 48 days. The author was unable to demonstrate the presence of trypanosoma in the blood of infected sheep or goats. The blood parasite was most easily demonstrated in the dog. The parasites were readily seen on the second day after the appearance of the disease. The clinical symptoms are described and attention is especially called to those symptoms which differentiate the tsetse-fly disease from other similar diseases. No medicinal treatment has proved successful. The author tried experiments with quinin, by way of the mouth and subcutaneously, and with arsenic by way of the mouth, without good results.

The action of human serum on the trypanosoma of the tsetse-fly disease, A. Laveran (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 13, pp. 735–739*).—During the author's researches on the subject of the treatment of tsetse-fly disease, human serum was injected into diseased animals, with the result that the blood parasite always disappeared. This result was considered somewhat surprising from the fact that the serum of animals which enjoy a natural immunity against a given disease is not ordinarily effective in the treatment of this disease. The experiments were repeated many times on rats and mice, and the results were always the same. The trypanosoma of tsetse-fly disease when injected into these animals increases rapidly in numbers until the death of the animals takes place. A dose of 0.5 cc., however, of human blood was sufficient to cause the parasites to disappear and the disappearance was more rapid and certain if the dose was increased to 1 or 2 cc. While injections of human serum thus appeared to have a remarkable curative effect, its preventive action was not very striking.

Report on the surra disease of cattle and horses in the Protectorate of Togo, SCHILLING (*Centbl. Bakt. u. Par., 1. Abt., 31* (*1902*), *No. 10, Orig., pp. 452–459*).—The author presents the results of his investigations on surra among horses and cattle. A considerable number of cases were observed and notes were made on the symptoms of the disease and on the pathological lesions. It was found that while the trypanosoma might be absent in many instances from the blood of the general circulation after death, the parasites were always present in large numbers in the red bone marrow. The author believes, therefore, that the anæmic condition which is a prominent symptom of this disease is not due so much to an attack of the parasite upon the fully developed red blood corpuscles, but to the destruction of the tissue in which the supply of red blood corpuscles is renewed.

Texas fever, CLAUDE and SOULIÉ (*Bul. Agr. Algérie et Tunisie, 8* (*1902*), *No. 3, pp. 65–73*).—An outbreak of this disease was reported as occurring in a dairy herd in Algeria, during which 10 out of the 35 cows died. The symptoms are described and an account is given of a number of post-mortem examinations which were conducted on the dead animals. A microscopic examination of the blood showed conclusively that the disease was Texas fever, and attention is called to the interesting fact of the comparatively large mortality during a cool season.

A second note on Texas fever, M. NICOLLE and ADIL-BEY (*Ann. Inst. Pasteur, 16* (*1902*), *No. 4, pp. 291–293*).—The authors continued their observations on the pathogenic effects of the organism of Texas fever, giving special attention to the conditions found in the liver, kidneys, and spleen. Sections of these organs were studied under a microscope. The fixing and staining methods used during these studies are described in detail.

The Queensland redwater immune cattle for South Africa (*Agr. Jour. Cape Good Hope, 20* (*1902*), *No. 3, pp. 184, 185*).—An experiment is being tried in Natal in the introduction from Australia of cattle immune to Texas fever. If the animals prove to be strictly immune to the disease, it is suggested that further extensive importations will probably be made from Australia and from North and South America.

The etiology of rinderpest, NICOLLE and ADIL-BEY (*Compt. Rend. Acad. Sci. Paris, 134* (*1902*), *No. 5, pp. 321–324*).—The authors made numerous experiments for the purpose of determining the relative size of the micro-organisms of rinderpest. It was found possible to select a Berkefeld filter of a thickness which would allow the organisms of rinderpest to pass through and would not permit the passage of other micro-organisms. The organisms of rinderpest, as well as of other diseases, may frequently be contained in white blood corpuscles, and it is therefore suggested that in order to make the microscopic examination more accurate the material should be first triturated, so as to set free micro-organisms which may have been contained in the leucocytes, and thus make possible their identification.

Studies on rinderpest, M. NICOLLE and ADIL-BEY (*Ann. Inst. Pasteur, 16* (*1902*), *No. 1, pp. 56–64*).—The authors conducted numerous experiments in the filtration of rinderpest virus under different conditions through different filters. The passage of virulent organisms through filters depends on the diameter of the pores of the filter, the thickness of the walls, and the surface of the filter. In addition to the factors of the problem which belong to the filter, the size of the organism, the nutrient medium, the temperature, and pressure are to be considered. Experiments were made in filtering the virus of rinderpest through a thin Berkefeld, a normal Berkefeld, and a Chamberland filter. The filtrate which was obtained from a thin Berkefeld filter proved to be inactive, of vaccinating power or virulent according to the conditions under which the filtration was done. The filtrate from the normal Berkefeld filter was likewise inactive, of vaccinating power or infectious according to circumstances, but it was inactive in a much larger number of cases than the filtrate from the thin Berkefeld filter. The filtrate from the Chamberland filter was for the most part inactive, rarely it had vaccinating power or was virulent. From these experiments the authors conclude definitely that the organism of rinderpest may pass through filters, but that the extent to which this occurs depends on a number of conditions.

Modifications of the leucocytes in rinderpest, Réfik-Bey (*Ann. Inst. Pasteur, 16 (1902), No. 2, pp. 163–168, figs. 6*).—An increase in the total number of leucocytes is frequently observed during the early stages of the disease, but this is followed by a diminution in the number, and another increase subsequently. The first increase in numbers takes place on the second or third day, when there may be as many as 18,200 per cubic millimeter. The number begins to decrease on the fourth day, the minimum is reached on the fifth day, or occasionally on the fourth, or even on the sixth or seventh. The lowest number observed was 2,000 per cubic millimeter. The mononuclear leucocytes did not participate in the first increase in the total number of the leucocytes. In half of the cases observed the number remained lower than normal, while in the other half it was largely increased. The polynuclear leucocytes reached a maximum during the first increase in the total number of leucocytes. After vaccination with bile the fluctuation in the number of leucocytes, which is characteristic of infection, disappears to a large extent. In animals vaccinated with serum followed by virus a temporary hyperleucocytosis was observed. The fluctuation in the number of polynuclear leucocytes was much more irregular than in the mononuclear.

A contribution to the tuberculosis problem, K. Müller (*Ztschr. Fleisch. u. Milchhyg., 12 (1902), No. 5, pp. 129–132*).—The author described in detail two cases of tuberculosis in butchers who exhibited a good family history and robust health and who had apparently contracted the disease in cuts and scratches while working with tuberculous animals. The evidence in these two cases for the transmission of bovine tuberculosis to man is considered by the author as quite conclusive.

The prevention of bovine tuberculosis, H. Raquet (*L'Ing. Agr. Gembloux, 12 (1902), No. 8, pp. 380–388*).—The author discusses in a general way the problems involved in the reduction of tuberculosis of cattle and especially of dairy cows. The means recommended for controlling this disease may be summarized as follows: The widest possible publication of the chief facts thus far established regarding the nature and spread of the disease; the subordination of indemnities paid for tuberculous animals to the strict enforcement of proper regulations for preventing contagion; the compulsory pasteurization of cream and other milk products in all cooperative creameries; the compulsory destruction of all the residues of centrifugal separation of cream, by means of strong chemical reagents; and frequent inspection of dairies by sanitary officers.

How to get rid of tuberculosis in cattle, W. C. Edwards (*Wallaces' Farmer, 27 (1902), No. 19, p. 694*).—A discussion is presented of the problem of the tuberculin test from a practical standpoint. It is argued that much opposition has been aroused against the extensive use of the tuberculin test, from the fact that certain veterinarians at first advocated the wholesale destruction of all animals which reacted to the test. Attention is again called to the fact that perfectly sound calves may be raised from cows badly infected with tuberculosis, and it is contended that tuberculous cows may thus be profitably made use of, and should therefore not be destroyed in a wholesale manner.

Remarks on the relations of human and bovine tuberculosis, C. H. CATTLE (*British Med. Jour., 1902, No. 2147, pp. 443–445*).—The author gives a critical review of Koch's arguments against the liability of transmission of tuberculosis from animals to man, or vice versa, and also of the arguments opposed to Koch's contentions. The author calls attention to the fact that physicians and veterinarians appear to be coming gradually to the belief that, as a rule, tuberculosis arises from direct infection or from case-to-case.

Tuberculosis, LIEBNER (*Fühling's Landw. Ztg., 51 (1902), No. 1, pp. 1–5*).—This article, like many others which have appeared since the publication of Koch's address at the British Congress on Tuberculosis, is occupied largely with presentation of arguments against Koch's position. It is urged that the possibility of transmission of tuberculosis from animals to man is still an open question, and that sanitary efforts to prevent the use of the meat and milk of tuberculous animals should be continued. Such products are considered harmful in addition to the possibility of their being infectious.

Tuberculosis in sheep, A. G. R. FOULERTON (*Public Health, 14 (1902), No. 9, pp. 544, 545*).—This account of the author's article is an abstract made from the article as read at the Pathological Society of London, April 15, 1902. On account of the rarity of tuberculosis in sheep it had been suggested that the blood of these animals might possibly contain an alexin which would tend to produce a partial immunity. Experiments in treating tuberculous guinea pigs with subcutaneous injections of extracts prepared from the spleen of sheep gave negative results, and it is believed, therefore, that sheep are not really immune, but owe their freedom to tuberculosis largely to circumstances of their environment.

Infection of swine with tuberculosis, S. STEWART (*Twentieth Century Farmer, 1902, No. 74, pp. 1, 2*).—The author discusses the pathological lesions caused by tuberculosis in hogs, and calls attention to the great danger of infection of these animals from eating the waste from slaughterhouses.

A case of tuberculosis of the lungs in Ursus malaianus, K. GEISENBERG (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 6, Orig., pp. 248–250*).—A post-mortem examination was made on a female Malay bear which had died of a wasting disease. The various pathological conditions found in the different organs are described in detail. Typical miliary tubercles of tuberculosis and giant cells were found in various tissues. The tubercle bacillus was found in such pathologically altered tissues, but no experiments were made to determine which variety of the bacillus was present in the tissue.

Tuberculosis in cold-blooded organisms, H. HERZOG (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 3, Orig., pp. 78–85, figs. 2*).—The author undertook to determine the pathological changes which are produced in frogs by inoculation with the tuberculosis of fish, and the question as to whether the organism of mammalian tuberculosis would produce pathological changes in cold-blooded animals. Eight frogs were inoculated with the tuberculosis of fish and were kept in water at a temperature of 15 to 16° C. In another experiment 2 frogs were similarly inoculated and kept in water at a temperature of 22° C. In 6 of the experimental frogs no changes in the organs were visible to the naked eye when the animals were killed. In the other 4 quite extensive changes were apparent; tubercles of varying size appeared in various organs and ulcerous perforations of the skin were observed in a few cases. In another experiment 4 frogs were inoculated with the organism of mammalian tuberculosis and kept at the ordinary temperature of the laboratory. Three of the frogs were killed after 16, 17, and 24 days, respectively; the other frog died 60 days after inoculation. Of these 4 frogs, 2 exhibited no special pathological changes. The other 2 gave evidences of infection. In 1 the lymph sac contained a reddish exudation and the spleen was swollen. In the other the liver was much enlarged and covered with numerous minute white spots. In the fourth experiment material was taken from one of the frogs in the last-mentioned experiment and was inoculated into 2 frogs and 1 guinea pig. The frogs were kept at the ordinary temperature of the room. Both frogs died, one 4 days and the other 15 days after infection. The guinea pig was killed about 8 weeks after the inoculation and a post-mortem examination showed that it had not become infected.

Observations and studies on a disease of the extremities observed in young cattle in South America, O. Voges (*Centbl. Bakt. u. Par., 1. Abt., 31* (*1902*), *No. 4, Orig., pp. 136–141*).—A report was made on a disease of cattle of quite wide distribution in South America. A most characteristic symptom is a striking lameness in one leg, the lameness being due to an inflammatory swelling, which later develops into a large suppurative abscess, involving a considerable portion of the extremity. The author attempted to isolate the pathogenic organism from the pus contained in such abscesses. A number of suspected organisms were cultivated and inoculation experiments were made, without success in demonstrating the causal relationship of any of them to the disease. No attempt was made to devise a serum treatment since it was found that a much less expensive remedy might be used. If the abscess is thoroughly opened and drained a prompt recovery takes place in all cases.

Carcinoma of the eye in cattle, O. Voges (*Centbl. Bakt. u. Par., 1. Abt., 31* (*1902*), *No. 4, Orig., pp. 142–145, fig. 1*).—Brief notes on the symptoms of this disease, together with a description of the appearance of the infection to the naked eye and the microscopic changes produced in the diseased tissues. The disease appears to be confined to pure-bred cattle, especially to the Hereford.

Study of sorghum poisoning in cattle, A. Peters (*Nebraska Sta. Rpt. 1901, pp. 50–54*).—On account of the numerous complaints received from farmers whose stock had been poisoned by eating sorghum, the author made a special effort to ascertain the circumstances surrounding such cases and to observe the symptoms and study the disease more carefully. In one case 15 cattle accidentally broke into a field of sorghum, where they remained 20 minutes; 3 of these cattle became sick and died within a few hours. Other similar cases of poisoning from sorghum are related. An experiment was tried, during which 2 young cattle were turned into a sorghum field. Only 1 of the animals ate any appreciable quantity of sorghum, and this animal was so badly affected that it fell to the ground within 10 minutes after entering the field. While in a recumbent position peculiar twitchings of the muscles in various parts of the body were observed. There was a partial paralysis of the tongue and increased salivation. The animal was finally killed when it was apparent that it would soon die, and a post-mortem examination revealed the fact that it had eaten 1½ lbs. of sorghum leaves. In this case, as well as in 11 other post-mortems, the author was not able to observe any evidence of sorghum leaves having become adherent upon the entrance of the trachea, so as to cause strangulation. In the cases thus far mentioned, poisoning was due to eating standing green sorghum. A few cases are reported of poisoning from eating sorghum several hours after it was cut. It is recommended that one animal be turned into the sorghum field first, and that others be allowed to enter if no symptoms of poisoning are observed in the first one. In this way serious cases of poisoning may be avoided to a great extent.

A study of the enzyms of green sorghum, H. B. Slade (*Nebraska Sta. Rpt. 1901, pp. 55–62*).—The author worked in connection with A. T. Peters in an investigation of the cause of sorghum poisoning (see above). Analyses were made of stalks of sorghum about 2 ft. high, in a vigorous growing condition. Extracts were obtained from such material, both in water and in a solution of common salt, which exercised more or less action upon starch. The action thus produced varied to a considerable extent, according to the part of the plant from which the extract was obtained and according to the method by which it was extracted. With guaiac and peroxid of hydrogen the extracts yielded a blue coloration. Analyses made by the author indicated the presence of a number of enzyms in green sorghum, among which mention is made of diastase, glucase, catalase, and oxydase. The enzyms thus far found do not appear to be the source of the poisonous product and the study is to be pursued further.

A poisonous plant—the common horsetail (Equisetum arvense), F. A. Rich and L. R. Jones (*Vermont Sta. Bul. 95, pp. 185–192, figs. 2*).—The poisoning of horses from eating common horsetail has been observed for several years in Vermont. Within the past five years 41 cases have been treated. The authors made a special investigation of the matter and conducted feeding experiments for the purpose of determining more accurately the symptoms and effective methods of treatment. A description of the plant is given. While the plant seems quite frequently to affect horses, no cases of poisoning from it are known in cattle; in fact, there appears to be evidence that dairy cows may eat it without harm. Two feeding experiments were carried out, involving 5 horses. The horses were old and not as susceptible as young horses to the poison contained in the plant. The symptoms appear gradually. At first, there is emaciation to be observed; in from 2 to 5 weeks the horse begins to lose control of its muscles and staggers, or may fall. Animals may eat after they have fallen and are unable to rise. The temperature is subnormal during the first stages of the disease, and the mucous membranes of the mouth, nose, and eyes become pale. Horses fed grain resist the action of the poison much longer than those which do not receive grain. No evidence was obtained that the green plant ever caused poisoning—apparently the plant causes trouble only when present in hay. The treatment recommended by the authors consists in the administration of Barbados aloes and ginger, followed by raw linseed oil and nux vomica, in the grain feed 3 times a day.

Experiments with malarial catarrhal fever of sheep, Spreull (*Agr. Jour. Cape Good Hope, 20* (*1902*), *Nos. 8, pp. 469–477; 9, pp. 530–534*).—Malarial catarrhal fever is a noncontagious but readily inoculable disease of sheep. The period of incubation is about 3 days and the beginning of the disease is marked by a condition of high fever. A blood parasite which affects the red blood corpuscles has been observed in cases of this disease. The mucous membrane of the mouth and lips turns blue and numerous sores appear in the mouth and on the tongue. The pure-bred Merino appears to be most susceptible, especially when young. The author undertook an extensive series of experiments in inoculation with the serum, bile, and pulp of the spleen of diseased animals. It was found that partial immunity might thus be produced and that it might be fortified by subsequent injections of virulent blood, beginning with small doses. Experiments with rabbits indicated that the symptoms of the disease might be produced in these animals by inoculation with virulent blood. Mild forms of the disease were also produced in goats, but they are apparently more resistant than sheep. In the inoculation experiments only 4 out of 80 sheep died of the disease. Similar experiments were made in the field with very good success.

Reindeer plague and the pathogenic bacillus of this disease, A. M. Bergman (*Ztschr. Thiermed., 5* (*1901*), *Nos. 4, pp. 241–283; 5–6, pp. 326–337, pls. 3, figs. 8*).—In the years 1896 and 1897 a serious outbreak of this disease occurred in Lapland. The outbreak was investigated by Prof. Lundgren and the pathological material obtained from this investigation was submitted to the author for further study. A detailed description is given of the pathogenic organism and notes presented on its growth and behavior on a large variety of nutrient media. The clinical symptoms and pathological anatomy of the disease are described. Reindeer plague resembles to some extent blackleg, malignant œdema, and braxy. The author gives the special characteristics of the reindeer plague by which it may be distinguished from the diseases which it resembles. An extended series of inoculation experiments were made on other animals, and the results of these experiments are discussed in considerable detail. The reindeer is the only animal in which a natural infection of the disease is known to have occurred. By artificial inoculation, however, the disease may be readily transmitted to sheep, guinea pigs, white mice, pigeons, and sparrows. The disease can be produced by inoculation also in cattle, cats, and frogs. Rabbits, dogs, hogs, and chickens appear to be completely immune. It is considered that if sheep were allowed to range in the localities where outbreaks of the disease occur among reindeer they would also become infected. In sheep inoculated with the disease the author succeeded in bringing about a recovery by hypodermic injections of weak solution of lysol. A vaccine was obtained which had the power of rendering sheep immune, but no experiments were made to determine the effectiveness of vaccine in reindeers.

Normal serum in hog cholera, S. Saltykow (*Ann. Inst. Pasteur, 16* (*1902*), *No. 1, pp. 94–96*).—Voges, as the result of his experiments, claimed that 0.1 cc. of the normal serum of guinea pig when injected subcutaneously in another guinea pig, protected the latter against infection from an injection at the same point of a dose 1,000 times the fatal size, from a culture of the hog cholera bacillus. The author tested these conclusions by means of experiments along the same line. The virulence of the culture obtained directly from hogs infected with hog cholera was augmented by passing through several guinea pigs. It was found that the fatal hypodermic injection was at least 200 times greater than the fatal peritoneal dose. The influence of normal serum of guinea pigs was found in the author's experiments to be practically nil. Experimental animals died as soon or sooner after injection than check animals.

The problem of the differential diagnosis of glanders, B. S. Trofimov (*Arch. Vet. Nauk, St. Petersburg, 32* (*1902*), *No. 2, pp. 134–152*).—Experiments were made for the purpose of determining the relative accuracy of different methods recommended for diagnosing cases of glanders. For this purpose 6 glanderous horses were tested with mallein and the blood was used for making cultures and for direct inoculation of guinea pigs. As the result of these studies it was found that the glanders bacillus was not always present in the blood of horses affected with this disease. Even in cases where the lymphatic glands and various internal organs are extensively affected by glanders, it may be impossible to demonstrate the presence of the glanders bacillus in the blood, either by making inoculations of fresh blood in guinea pigs or by using the blood in cultures.

The diseases of the horse which are grouped together under influenza, Dieckerhoff (*Ztschr. Veterinärk., 14* (*1902*), *No. 1, pp. 1–8*).—Of the various diseases which have been included under the name influenza, the author recognizes and gives a differential diagnosis for the following: Contagious pneumonia, distemper of horses, scalma, acute infectious laryngeal catarrh, infectious inflammation of the pharynx, and epizootic cough.

Pneumonia of horses, Iwersen (*Ztschr. Veterinärk., 14* (*1902*), *No. 4, pp. 162–165*).—The author attempted to answer the question whether a quarantine period of 6 weeks was sufficient in preventing the spread of this disease. It was found that in one instance an outbreak of the disease occurred among horses 4 months after bringing them into quarantine. Experiments indicated, however, that immediate isolation of the first case and scrupulous disinfection of the premises are effective in preventing the further spread of the disease.

Experiments in the artificial transmission of pneumonia of horses, C. Troester (*Ztschr. Veterinärk., 14* (*1902*), *No. 4, pp. 159–162*).—The author attempted to determine whether the organisms and virus of this disease were contained in the excretion from the kidneys. Experiments were instituted during which small quantities of the urine of diseased animals was fed to colts upon their other food. In all cases an elevation of temperature took place, but the animals recovered within a few days. It appears from these experiments that the virus of the disease may be excreted by the kidneys.

The present status of investigation concerning the South African horse

disease, Kaesewurm (*Ztschr. Veterinärk., 14 (1902), Nos. 1, pp. 8–18; 2, pp. 63–71*).—This disease, which is also known as horse sickness and Paardenziekte, was described in 1881 as a peculiar outbreak of anthrax. Later investigations led to the discovery of a blood parasite similar to that of malarial and Texas fever of cattle. The author discusses in a critical manner the literature relating to the method of infection, clinical symptoms, diagnosis during life, the anatomical alterations, and prophylactic treatment by means of serum injections.

An epizootic of herpes, Christiani (*Ztschr. Veterinärk., 14 (1902), No. 3, pp. 101–108*).—The author discusses an unusually severe outbreak of this disease which occurred in several localities during the season of 1900. In the majority of cases the disease was confined to isolated parts of the skin. In 7 horses, however, the eruption rapidly spread over the whole body. In treating these cases it was found that corrosive sublimate dissolved in water was not very satisfactory. Better results were obtained from the use of soapsuds. It is recommended that in treating this disease care should be exercised not to apply too drastic remedies, which may render it difficult to determine by inspection when the cause of the disease has been removed.

Internal treatment of morbus maculosus with 10 per cent iodin-vasogen, Straube (*Ztschr. Veterinärk., 14 (1902), No. 2, pp. 71–73*).—In a serious case of this disease, which would probably have resulted fatally, the author decided to use the iodin preparation known as iodin-vasogen. A 10 per cent solution was employed and 15 gm. was administered along with oats each day for 4 days, making a total of 60 gm. The temperature of the animal fell and the petechial spots disappeared. It is believed by the author that this substance furnishes a valuable remedy for morbus maculosus.

Antistreptococcic serum for contagious coryza and morbus maculosus, Maier (*Ztschr. Veterinärk., 14 (1902), No. 3, pp. 112–117*).—An antistreptococcic serum having been prepared in the Pasteur laboratory in Stuttgart and placed upon the market, the author tested the action of this remedy in the treatment of contagious coryza and morbus maculosus. In treating the former disease it was found that the serum was not inactive, but the experiments showed that in severe cases it was not very effective. In treating morbus maculosus, however, the results were more satisfactory, and it is believed that as soon as the remedy can be manufactured more cheaply it will come into more general use.

Common parasites of domestic animals, L. L. Lewis (*Oklahoma Sta. Bul. 53, pp. 24, figs. 11*).—This bulletin contains a popular account of the habits, appearance, and means of combating a number of animal parasites which commonly attack domesticated animals. The species upon which special notes are given include botfly, stomach worms of cattle and sheep, round worm of hogs, thorn-headed worm, short-nosed and long-nosed ox louse, biting louse of cattle, hog louse, cattle tick, screw worm, hen flea, horn fly, biting louse of horses and mules, sucking horse louse, ox botfly, and mange mites of sheep, cattle, and horses. The remedies usually applied in combating these parasites are recommended in the bulletin. In tests with creolin, zenoleum, and other coal-tar disinfectants, it was found that hog lice could not be killed with less than a 2½ per cent solution. In dipping experiments a 1 per cent solution of these coal-tar preparations was found to be of little or no avail. Kerosene emulsion, when made in the proportion of ½ lb. hard soap and 2 gal. kerosene to 1 gal. of water, proved to be a very effective remedy. In combating horn fly, good results are reported from the use of a mixture of creolin, fish oil, and kerosene, and from a mixture of pulverized resin, soap shavings, water, fish oil, oil of tar, and kerosene.

Intravenous injections of corrosive sublimate, A. Serafini (*Munich: J. Lehmann, 1902, pp. 16; reprinted from München. Med. Wchschr., 1902, No. 16*).—The author discusses in a critical manner the experiments which have thus far been conducted in the use of corrosive sublimate by intravenous injections. Experiments were made on rabbits which had previously been infected with anthrax. It was found that intravenous injections of corrosive sublimate had no effect on the development of the disease or the multiplication of the organisms in case of injections varying in size from 1 to 5 mg., and varying in proportion to the total weight of the blood from 1:150,000 to 1:130,000. It is believed, therefore, that this method of treatment can not be adopted with expectation of success in other animal or human diseases.

Farm management of germ diseases, J. J. REPP (*Breeders' Gaz., 41 (1902), Nos. 7, pp. 309, 310; 8, pp. 364, 365*).—The author gives a popular discussion of the various methods by which the different infectious diseases may be transmitted from one locality to another, and outlines practical remedies which may be applied in preventing the transmission or in disinfecting premises after the occurrence of contagious diseases.

AGRICULTURAL ENGINEERING.

Sanitary engineering; a practical manual of town drainage and sewage and refuse disposal, F. WOOD (*London: Charles Griffin & Co., Ltd.; Philadelphia: J. B. Lippincott Co., 1902, pp. 304, figs. 181*).—In this book the attempt is made to deal with the principles of the subject "in a comprehensive, concise, and easily intelligible form," with a view to meeting the needs of "sanitary authorities, engineers, inspectors, architects, contractors, and students." In addition to a brief introduction, the book contains chapters on hydraulics; formulæ for velocity of water in pipes; earth pressure and retaining walls; power; house drainage; land drainage; sewers, separate system (for sewage and rainwater); sewage pumping; sewer ventilation; drainage areas; sewers, manholes, lampholes, etc.; trade refuse and river pollution; sewage disposal; bacteriolysis (bacteriological purification of sewage); sludge disposal; construction, materials, and cleansing of sewers; refuse disposal; and chimneys and foundations. The subjects of refuse destruction and refuse destroyers receive special attention. "Two chapters are specially devoted to the study of sewage disposal, and most of the well-known systems are briefly and sufficiently described to give a fair idea of the methods of working them. A chapter has been allotted to bacteriolysis, which is more fully and amply discussed owing to the special importance which has been attached to it in recent years, and to the large amount of data available."

Irrigation farming, L. M. WILCOX (*New York: Orange Judd Co., 1902, rev. and enl. ed., pp. 494, pl. 1, figs. 113*).—The first edition of this book appeared in 1895. The revision and enlargement in the present edition consists mainly of the addition of the following sections: Addition of silt, manure on irrigated soil, the Newsom system of water supply, the drop-head, silting of reservoirs, the arc stave flume, advantage of large heads, the Stokes measuring gate, a simple method of measuring water, importance of grading, the dammer, a caution against erosion, the depth of soaking, the contour system, wheat by subirrigation, rhubarb, roses, cultivation, the plowsole, nuts, foreign grapes, cranberries, Turkestan alfalfa, grain with alfalfa, alfalfa in rotation, the alfalfa sandwich, capacity of windmills and reservoirs, battle-ax windmills, the merry-go-round, the propeller pump, hot-air engines, pumping from quicksand, the Van Horn tap gate, simple grade levels, a ditch cleaner, a tandem hitcher, manure vat, the corrugated roller, and irrigation hardpan. New chapters are added on the following subjects: Seepage and drainage, electricity in irrigation, irrigation in humid climates, and winter irrigation. There has been no correction of the scientific inaccuracies so conspicuous in the earlier edition (E. S. R., 7, p. 431).

Irrigation in humid climates, C. S. PHELPS (*Massachusetts State Bd. Agr. Rpt. 1901, pp. 398-415*).—This article discusses the importance of irrigation to the New England farmer, gives instances of successful irrigation, makes suggestions regarding means of making water available (rams, windmills, steam power), and describes methods of applying water.

Irrigation (*Rpt. Registrar-Gen. on Agr. and Pastoral Statis.* [*Queensland*], *1901, pp. 16–18*).—Statistics are given of the area irrigated, the source of the water supply and the means of utilizing it, and the crops grown under irrigation.

Reclaiming the arid Southwest, R. M. Barker (*Forum, 33* (*1902*), *No. 3, pp. 363–371*).—A general review of the more important physical characteristics of this region and of the progress made in its development under irrigation.

The prevention of the pollution of streams by modern methods of sewage treatment, L. P. Kinnicutt (*Science, n. ser., 16* (*1902*), *No. 396, pp. 161–171*).

Influence of height of wheel on the draft of farm wagons, T. I. Mairs (*Missouri Sta. Bul. 52, pp. 143–165, figs. 8*).—This bulletin reports the results of a number of tests of the draft of wagons, equipped with wheels of different height, on macadam, gravel, and dirt roads in all conditions, and on meadows, pastures, cultivated fields, stubble land, etc. The draft was measured by means of a Giddings self-recording dynamometer, the net load in every case being the same, namely, 2,000 lbs. Three sets of wheels of different heights, all with 6 in. tires, were used as follows: Standard, front wheels 44 in., rear wheels 55 in.; medium, front wheels 36 in., rear wheels 40 in.; low, front wheels 24 in., rear wheels 28 in. The results obtained were in brief as follows:

"For the same load, wagons with wheels of standard height drew lighter than those with lower wheels.

"The difference in favor of the standard wheels was greater on road surfaces in bad condition than on good road surfaces.

"Low wheels cut deeper ruts than those of standard height.

"The vibration of the tongue is greater in wagons with low wheels.

"For most purposes wagons with low wheels are more convenient than those of standard height.

"Wagons with broad tires and wheels of standard height are cumbersome and require much room in turning.

"Diminishing the height of wheel to from 30 to 36 in. in front and 40 to 44 in. in the rear did not increase the draft in as great proportion as it increased the convenience of loading and unloading the ordinary farm freight.

"Diminishing the height of wheels below 30 in. front and 40 in. rear, increased the draft in greater proportion than it gained in convenience.

"On good roads, increasing the length of rear axle so that the front and rear wheels will run in different tracks to avoid cutting ruts, did not increase the draft.

"On sod, cultivated ground, and bad roads, wagons with the rear axle longer than the front one, drew heavier than one having both axles of the same length.

"Wagons with the rear axle longer than front one require wider gateways and more careful drivers, and are on the whole very inconvenient and not to be recommended for farm use.

"The best form of farm wagon is one with axles of equal length, broad tires, and wheels 30 to 36 in. high in front and 40 to 44 in. behind."

Agromotive, E. Deligny (*Jour. Agr. Prat., n. ser., 4* (*1902*), *No. 32, pp. 180–182, fig. 1*).—Under this name a form of farm traction engine is described.

Refrigerating machines, H. d'Anchald (*Jour. Agr. Prat., n. ser., 4* (*1902*), *No. 36, pp. 316–318, figs. 5*).—A number of machines are described.

The ventilation of stalls, R. Preuss (*Deut. Landw. Presse, 29* (*1902*), *No. 72, p. 592, fig. 1*).

MISCELLANEOUS.

Report of California Station, 1899-1901 (*California Sta. Rpt. 1899-1901, pt. 1, pp. 144*).—This includes the organization list of the station; financial statements for the fiscal years 1899–1901; a review of the work of the station during the three years by the director and of the substations by C. H. Shinn; a report on farmers' institutes by E. J. Wickson, numerous articles noted elsewhere, brief abstracts of several bulletins of the station, and a reprint of Bulletin 130 on Preservation of Unfermented Grape Must (E. S. R., 12, p. 794).

Thirteenth Annual Report of Delaware Station, 1901 (*Delaware Sta. Rpt. 1901, pp. 213*).—This includes a financial statement for the fiscal year ended June 30, 1901, the organization list, and reports of the agriculturist, mycologist, chemist, horticulturist, entomologist, and meteorologist, noted elsewhere.

Biennial Report of Iowa Station, 1900–1901 (*Iowa State Col. Agr. Rpt. 1900–1901, pp. 14–20, 54–58, 84*).—An account of the work of the station during the year and financial statements for the fiscal years ended June 30, 1900 and 1901.

Ninth Annual Report of Minnesota Station, 1901 (*Minnesota Sta. Rpt. 1901, pp. XXII + 366*).—This contains the organization list of the station, a financial statement for the fiscal year ended June 30, 1901, a report of the director reviewing at some length the work of the different divisions of the station and of the experimental farms, and reprints of Bulletins 69–72 of the station on the following subjects: Bugs injurious to our cultivated plants (E. S. R., 13, p. 66), influence of wheat farming upon soil fertility (E. S. R., 13, p. 546), investigation in milk production (E. S. R., 13, p. 683), the forest garden (E. S. R., 13, p. 1053), and fruits and shrubs (E. S. R., 13, p. 1048).

Fifteenth Annual Report of Nebraska Station, 1901 (*Nebraska Sta. Rpt. 1901, pp. 62*).—This includes the organization list, a report of the director on the work of the station during the year, a financial statement for the fiscal year ended June 30, 1901, an article on Some Forage Plants for Summer Feed, already noted (E. S. R., 13, p. 176), and several articles abstracted elsewhere.

Agricultural experiment stations in foreign countries, A. C. TRUE and D. J. CROSBY (*U. S. Dept. Agr., Office of Experiment Stations Bul. 112, pp. 230*).—This is a list of the agricultural experiment stations and other institutions in foreign countries, in connection with which investigations relating to agriculture are conducted. The information regarding each is given under the following headings: Governing board, station staff, origin, equipment, income, and lines of work. A general review of the subject, constituting an introduction to the bulletin, is taken mainly from an editorial in this journal (E. S. R., 13, p. 605).

Our foreign trade in agricultural products, 1892-1901, F. H. HITCHCOCK (*U. S. Dept. Agr., Section of Foreign Markets, Bul. 27, pp. 67*).—The following table summarizes some of the statistics given in the bulletin:

Value of imports and exports of the United States, 1892–1902.

Year ended June 30—	Imports.			Domestic exports.			Excess of agricultural exports over agricultural imports.
	Total.	Agricultural.	Per cent agricultural.	Total.	Agricultural.	Per cent agricultural.	
	Dollars.	*Dollars.*		*Dollars.*	*Dollars.*		*Dollars.*
1892	827, 402, 462	436, 697, 057	52. 8	1, 015, 732, 011	803, 122, 045	79. 1	366, 424, 988
1893	866, 400, 922	425, 657, 448	49. 1	831, 030, 785	621, 201, 671	74. 8	195, 544, 223
1894	654, 994, 622	365, 160, 319	55. 8	869, 204, 937	636, 633, 747	73. 2	271, 473, 428
1895	731, 969, 965	373, 115, 985	51. 0	793, 392, 599	558, 385, 861	70. 4	185, 269, 876
1896	779, 724, 674	391, 029, 407	50. 1	863, 200, 487	574, 398, 264	66. 5	183, 368, 857
Annual average, 1892–1896	772, 098, 529	398, 332, 043	51. 6	874, 512, 164	638, 748, 318	73. 0	240, 416, 275
1897	764, 730, 412	400, 871, 468	52. 4	1, 032, 007, 603	689, 755, 193	66. 8	288, 883, 725
1898	616, 049, 654	314, 291, 796	51. 0	1, 210, 291, 913	859, 018, 946	71. 0	544, 727, 150
1899	697, 148, 489	355, 514, 881	51. 0	1, 203, 931, 222	792, 811, 733	65. 9	437, 296, 852
1900	849, 941, 184	420, 139, 288	49. 4	1, 370, 763, 571	844, 616, 530	61. 6	424, 477, 242
1901	823, 172, 165	391, 931, 051	47. 6	1, 460, 462, 806	951, 628, 331	65. 2	559, 697, 280
Annual average, 1897-1901	750, 208, 381	376, 549, 697	50. 2	1, 255, 491, 423	827, 566, 147	65. 9	451, 016, 450

The leading agricultural imports during 1901, mentioned in the order of their importance, were sugar, coffee, hides and skins, silk, vegetable fibers, fruits and nuts, tobacco, wool, and tea, and the leading agricultural exports were cotton, wheat, corn, wheat flour, lard, cattle, bacon, fresh beef, leaf tobacco, ham, oil cake and oil-cake meal, and cotton-seed oil.

Agricultural imports of the United Kingdom, 1896–1900, F. H. Hitchcock (*U. S. Dept. Agr., Section of Foreign Markets Bul. 26, pp. 227*).—Statistical tables are given showing the kinds, values, and quantities of the agricultural imports from the different countries of supply for each of the 5 years 1896–1900. The total value of the agricultural imports in 1900 was $1,578,000,000, or 62 per cent of the entire import trade of the United Kingdom. The United States supplied about 33 per cent of the agricultural produce.

Suggestions to pioneer farmers in Alaska, C. C. Georgeson (*Alaska Sta. Bul. 1, pp. 15, pls. 7*).—This bulletin discusses clearing and draining land under Alaskan conditions, points out briefly the value of oxen as work animals, and gives directions for the construction of a log silo. The sterility of new ground in Alaska, to which attention has been called in former publications (E. S. R., 13, p. 125), is again discussed, and methods of bringing these soils to a satisfactory state of fertility are recommended.

Agricultural monograph of the Polder region of Belgium (*Monographie agricole de la région des Polders. Brussels: Ministry of Agriculture, 1902, pp. VI+85*).—The region discussed in this monograph is a zone 10 to 15 kilometers wide, running parallel with the coast from Furnes to Knocke. As in previous monographs of this series (E. S. R., 13, pp. 723, 799), the subjects discussed are climate and soil (see p. 230), agricultural operations (plant and animal production and agricultural manufacturing industries), permanent improvements, and the agricultural régime.

Teaching agriculture in Germany, II, J. Vandervaeren (*Bul. Agr.* [*Brussels*], *18* (*1902*), *No. 2, pp. 160–198*).—A brief summary of the different kinds of schools and methods of teaching agriculture in Germany.

Teaching agriculture in Austria, J. Vandervaeren (*Bul. Agr.* [*Brussels*], *18* (*1902*), *No. 2, pp. 199–213*).—A summary of methods and courses in agriculture in Austria.

Practical agriculture, C. C. James (*New York: D. Appleton & Co., 1902, pp. 203, figs. 90*).—This book, the American edition of which is edited by John Craig, discusses the plant, the soil, the most common and important field and garden crops, the orchard, the vineyard, stock raising and dairying, and presents a chapter each on bees, birds, forestry, roads, and the rural home.

Practical manual for the farmer, L. Beuret and R. Brunet (*Manuel pratique de l'agriculteur. Paris: L. Mulo, 1901, pp. 640+36, figs. 115*).—This book is divided into 3 parts, the first being devoted to meteorology, soils, fertilizers, drainage, irrigation, cultivation, and machinery; the second to cereals, industrial plants, viticulture. meadows, forage crops, horticulture, sylviculture, insects, and plant diseases, and the third to stock raising, wine, cider, beer, and resin making, silkworm culture, beekeeping, and other industries.

NOTES.

Colorado College and Station.—E. D. Ball, assistant in zoology and entomology, has accepted the professorship of biology at the Utah College, and has entered upon his new work. Amos Jones, assistant professor of irrigation engineering, has accepted a position in the U. S. Geological Survey. The college and station are planning numerous improvements. A reservoir with an area of 50 acres and an inlet ditch for conducting storm water from an extensive watershed have been under construction during the year. A building for a central heating plant is in course of construction. This building will also be used for a department of electrical engineering. A building for the department of irrigation engineering and to contain the offices of the station is planned. This is to cost about $60,000. An appropriation from the legislature will be asked for this purpose.

Delaware College and Station.—C. O. Houghton, an assistant in the entomological department of Cornell University, has been elected zoologist and entomologist in the college and entomologist to the station, vice E. D. Sanderson, who, as previously noted, has gone to Texas.

Michigan College and Station.—Dr. R. C. Kedzie, who had been connected with the college for nearly forty years and with the station ever since its establishment, died November 7, after a short illness. A brief account of his services to agriculture will be given in the next number.

Oregon College and Station.—The new Agricultural Hall was dedicated with appropriate ceremonies October 15. It is a handsome building of three and a half stories, costing something over $40,000. It is 125 by 85 ft. and provides 35,000 square feet of floor space. On the first floor are the live-stock judging room, 40 ft. square, and the dairy department. The latter includes a main workroom 24 by 44 ft., provided with modern apparatus for the manufacture of butter and cheese, a testing laboratory 24 by 40 ft., which will also be equipped for pasteurizing in the near future, two commodious cheese-curing rooms, class room, office, boiler and engine room, etc. The second floor has a large hall to be used as an assembly room for conventions and for special lectures to students in agriculture. The office of the station director, fireproof vault for records, a spacious class room for general agriculture, and laboratories for soil physics and bacteriology are also located on this floor. A special bacteriological laboratory for station work is provided. The departments of horticulture, entomology, and botany are located on the third floor. Here provision is made for both the instruction and experimental work, there being a number of separate rooms for the station laboratories and collections. The entire south wing of the building, including the three stories, is devoted to chemistry. Here also special provision has been made for the station work, with separate storage rooms, laboratories, balance rooms, dark room, office of the station chemist, etc. The upper floor will be used as a general museum. The building will add greatly to the facilities of the institution for instruction in agriculture and for the work of the experiment station whose departments were previously somewhat scattered.

Pennsylvania College and Station.—C. A. Browne, jr., first assistant chemist, has resigned to accept a position at the Louisiana Sugar Station. It is expected that his time will be quite largely occupied in the chemical investigation of problems connected with the manufacture of sugar from cane. C. W. Norris, assistant chemist, has resigned to accept a position with a fertilizer firm in Philadelphia. The foundation has been completed for an assembly hall, the gift of Mr. and Mrs. Chas. M. Schwab. The original amount of the gift has been increased to $140,000. The building will be a handsome structure of Roman brick with light terra-cotta trimmings, and will serve as a chapel and general assembly hall. Plans are being drawn for the new Carnegie library, for which $100,000 was donated to the college last commencement. Some minor alterations are being made in the respiration calorimeter, which were suggested by the experience with the apparatus last winter. An electric motor will be substituted for the gasoline one for operating the pumps, the gasoline engine not having been found sufficiently regular and reliable in its work for such delicate experiments. It is planned to carry on a series of experiments with the respiration calorimeter the coming winter, using steers as subjects.

Wisconsin College Station.—John C. Brown has been appointed instructor in agricultural chemistry in the college and assistant chemist of the station.

U. S. Department of Agriculture.—The total number of officers and employees of different grades in the Department has more than doubled in the last ten years. The number on July 1, 1893, was 1,870, and on July 1, 1902, 3,789, showing an increase of 1,919. The number of scientific workers and their assistants in the Department (including the Weather Bureau observers and meat inspectors) was 2,081 on July first last, and the number of executive officers and administrative assistants 1,708, making the total number of employees 3,789.

The Bureau of Plant Industry has constructed a barn at the Arlington Experimental Farm. The building is of brick, 40 by 100 ft. and two stories high, with a large attic or loft. It contains rooms for the storage of crops, seeds and machinery, a root cellar, stalls for a number of horses, a photographic laboratory, and office rooms. Such a structure has been much needed and will greatly facilitate the Department's work on this farm. The cost was about $4,000.

A seed building 60 by 100 ft., and two stories high has just been completed which will provide offices and workrooms for the seed and plant introduction, storage for the special seeds, paint and carpenter shops for the Bureau of Plant Industry, etc. This building was provided for in the last appropriation act, which allowed the use of $10,000 out of the fund for seeds for the erection of a warehouse for the seed handled by the Department.

Several new greenhouses and a large potting shed have been erected, and a new central heating plant for the greenhouses and offices in the vicinity has been installed. This plant will take the place of 13 separate heaters, which were put in from time to time as the greenhouses were extended.

Miscellaneous.—The Seventh International Congress of Agriculture will convene in Rome in the spring of 1903. The exact dates will be given out later with the programme. The congress will be divided into the following sections: Rural economy, agricultural education, agronomy, animal husbandry, agricultural engineering, special crops and their corresponding industries, vegetable pathology, forestry, pisciculture, and viticulture and enology. To become a member of the congress it is necessary to make application to the Commission of Organization, Via Poli 53, Rome, before January 31, 1903, and to remit a membership fee of 20 francs. It is also desired that applicants state what particular section of the congress they wish to attend. Persons desiring to present papers are requested to send them to the Commission of Organization before December 15, 1902. The languages to be used at the congress are

Italian, French, German, and English, and the proceedings are to be published in Italian and French.

The German Experiment Station for the Leather Industry gives a report of its work for 1901 in a recent number of *Chemiker Zeitung* (26 (1902), No. 77, p. 899). This station is located at Freiberg, Saxony, and is under the directorship of Dr. Johannes Paessler. The present report is its fourth, and shows that there has been a steady growth each year in the amount of analytical work called for. This consists of examination of raw materials and finished products, tannin extracts and preparations, fats and oils, waters, etc. In addition a number of investigations were carried on upon different phases of the leather industry. Work was done for private individuals and for the German army and navy officials, and expert advice was furnished to a number of tanneries and similar establishments.

The work of the agricultural department in the Hampton Normal and Agricultural Institute is being considerably broadened. The introduction recently of agriculture into all the courses of the institute has increased the work of the agricultural department, so that the employment of two assistants to Prof. C. L. Goodrich has been necessary. George Hosford, a graduate of Cornell in the class of 1902, has been put in charge of the horticultural work, and R. E. Eastman, a graduate of Kansas Agricultural College, who has recently taken a master's degree at Cornell, has been put in charge of the landscape gardening work. This work during the coming year will be quite important, owing to the fact that many of the institute buildings are to be moved, sewers are to be put in, and the walks and drives laid out to conform with the new scheme. In dairy work the institute is making considerable progress. A large herd of grade Holsteins is maintained; also a herd of ordinary cows. Accommodations for these animals are at present inadequate, but a modern dairy barn, about 170 ft. long by 40 ft. wide, is now being constructed. On one side of the main structure a small wing contains two rooms for straining and cooling milk and keeping records, while on the opposite side is a wing for storing feed in small quantities. It is thought inadvisable to store large quantities of forage in connection with the dairy barn, so another building will be erected for this purpose. The nature-study bureau of the institute has begun the publication of leaflets for farmers. Two series of these leaflets are published, one on agriculture, the other on animal industry.

The National Farm School at Doylestown, Pa., which entered upon the year with a new director and nearly entirely new teaching force, is in a prosperous condition. The school has about 40 students, 20 of whom are freshmen. A quite large poultry department has been added, with I. B. Gage, a graduate of the Rhode Island Poultry School, in charge. A piggery and sheep shed are being erected and arrangements provided for the proper care of the manure. A number of minor alterations are being made in other buildings to better suit them to their purpose, and it is hoped later to erect a small dormitory, which is much needed. The present director of the school is Dr. J. H. Washburn, formerly of Rhode Island. The agriculturist is L. J. Shepard, who was previously connected with the Maine College and Station, and the horticulturist is W. B. Madison, a graduate of the Rhode Island College.

According to a recent press bulletin from the University of Illinois several counties in that State are organizing young people's clubs to cooperate during the coming year with the experiment station and college of agriculture of the University of Illinois in various lines of experimental work. Clubs have been organized in Scott, Winnebago, McHenry, La Salle, Sangamon, McLean, McCoupin, and other counties. At present the young people comprising the membership in these clubs are engaged in the experimental work of testing seed corn and in growing corn or flowers in competition for special premiums to be offered at their institutes next winter. The results of the tests are recorded on prepared blanks and sent to the college of agriculture, where they are tabulated.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*

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Horticulture—C. B. Smith.
With the cooperation of the scientific divisions of the Department.

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Another landmark of a pioneer agricultural institution is gone. His name is associated with the development of agricultural science as well as of agricultural education, for he was one of the pioneers in experimental work for agriculture in this country. His long life of unusual activity and usefulness closed, after a brief illness, November 7, and it only remains to record a few of the public services and personal characteristics of Dr. Robert C. Kedzie.

Doctor Kedzie was born of Scotch parents at Delhi, New York, in 1823. His family moved to Michigan when he was 3 years old and settled in Lenawee County. He entered Oberlin College at the age of 17 and graduated with the degree of B. A. six years later. After teaching two years he entered Michigan State University, from which he graduated with the first medical class in 1851. He practiced medicine until 1861, when he entered the army and served as surgeon for two years. Resigning from that service he was appointed to the chair of chemistry at the Michigan Agricultural College in 1863. At that time the institution was in a somewhat disorganized state, and its future existence was threatened. He threw his whole thought and energy into the task of shaping its policies and establishing it on an enduring basis; and from that day until his death he was one of the leading spirits and strongest personalities at the institution. His influence for the college and for agricultural education was exerted in the councils of the institution, in the State legislature, where he represented his county, in the farmers' institute, and through the public press. He was strong in his belief in agricultural education, and his zeal for the cause never wavered.

His death closed a period of nearly 40 years of continuous teaching, during which time every class that passed through the institution received an important part of its instruction in chemistry at his hands. As a teacher he was clear and forceful, with an extraordinary power of carrying conviction, thorough to a degree, and uncompromising in his demands upon his students. It is perhaps in this capacity that his greatest strength lay and his strongest influence was exerted.

Doctor Kedzie's experimental work for agriculture was not distinguished by profound and exhaustive investigation, but was largely of the practical pioneer sort which has been so useful in improving agricultural conditions and practice, and so important in preparing the way for succeeding work. Upon going to the college he took up the study of the muck lands and the value of composts of muck with animal manures and night soil for grass lands, corn, and potatoes. In 1866 some experiments were made on the relation of the volatile constituents of animal manures to vegetable growth; and these were followed by extended experiments to determine the value of such mineral fertilizers as wood ashes, lime, land plaster, salt, etc., for farm crops. Later the soils of the State were analyzed and their agricultural values studied. He early perceived the dangers of soil exhaustion under the profligate system of farming which was being practiced, and sounded the note of warning to conserve its fertility by rotation and by returning the manure to the soil. As early as 1863 he began an elaborate system of meteorological observations at the college, which have been continued without interruption to the present time.

He won the confidence of the farmers by his earnest work in their behalf, the practical character of it, and the zeal with which he championed their cause. He considered his work outside the class room as belonging to the public that supported the institution, and never felt better than when exposing with caustic denunciation the impositions and frauds foisted upon the public by unscrupulous dealers. He scented the battle afar off, and went into it with vim and vigor and an incorruptible honesty that overwhelmed opposition. Two notable instances of this were his crusade against unprincipled lightning-rod agents, and against the producers of low-test and dangerous illuminating oils. The latter campaign resulted in the passage of a State law establishing the flash-light test, and the employment of "Michigan test" as a trade-mark for high quality.

The Michigan State law relative to the control of the sale of commercial fertilizers was instigated by Doctor Kedzie, as were also laws for the protection of the public from the dangers of arsenical poisons in wall paper, dress goods, and the like. Through his investigation of the chemical composition, baking quality, and vesiculating power of Clawson wheat, which the millers of the State persisted in grading below its proper quality, he fought and won a battle for the farmers of the State which resulted in adding thousands of dollars to Michigan agriculture.

The development of the sugar-beet industry in Michigan must be credited largely to Doctor Kedzie. He imported the first seed, grew and analyzed the first beets, was directly instrumental in the building of the first Michigan factory, and was one of the strongest champions of the industry.

Farmers' institutes in Michigan also owe their origin to the initiative of Doctor Kedzie. In 1875 he offered a resolution to the faculty calling for the appointment of a committee to make arrangements for holding agricultural meetings with farmers, in which members of the faculty, the State board, successful farmers, and local talent should participate. He was made chairman of this committee, and for twenty years was one of the most popular, forceful, and convincing speakers at these meetings.

The change in Doctor Kedzie's career from medicine to agricultural chemistry is rather remarkable in two ways. At that period it was not customary to require very advanced chemical instruction in a medical school, and Doctor Kedzie must have been unusually proficient in that science to be called to a chair of chemistry after thirteen years of practice as a physician and surgeon. It is still more remarkable that having entered upon his chemical work with such an absorbing zeal, he retained his position in the medical profession. This is probably due to his connection with the State board of health, of which he was president for two terms. This position brought him prominently before the people of the State as an advocate of various sanitary reforms, and he did not relinquish his efforts in that direction when he voluntarily withdrew from the board in 1881. He was honored alike by the medical and chemical professions by election to the highest offices in their State and National associations. This shows the breadth and genius of the man, and the broad field through which his influence and strong personality were felt. In his death agriculture and science have lost an effective teacher, and his college one of its wisest counselors.

The initial number of a yearbook of the Russian experiment stations and similar institutions has recently been received. This is to be the organ for summarizing the work of the various institutions for the benefit of agriculture in Russia, and thus bringing together the heretofore scattered reports of their progress. It is a government publication, issued by the Ministry of Agriculture and Imperial Domains — Department of Agriculture, and will hereafter appear annually. The volume contains over six hundred pages, with numerous illustrations. The plan is not to publish detailed papers, but rather summaries of all the work, classified by subjects and also on a geographical basis. It will not, therefore, replace the present special reports issued by the stations, or any other form of publication, but will better enable investigators and others to follow the work of the Russian stations as a whole. The widely divergent conditions in different parts of the Empire as to climate, soil, biological aspects, and economic status are thought to make a geographical arrangement the more useful. For example, the work at the institutions in the northern nonchernozem region of Russia is brought together in two chapters, that in Western and Southern Russia is discussed in two others, and a fifth chapter is devoted to the work of the stations located on the southern boundary of European Russia.

An introductory chapter gives a general historical review of agricultural experimentation in Russia, an account of its present scope, and the condition of the experimental institutions, which represent a variety of grades. According to this, the first experiment station in Russia, established in 1864, was in the nature of a control station, connected with the Polytechnic Institute at Riga. The second was a station for seed selection, connected with the Imperial Botanical Garden in St. Petersburg, and established in 1877; and the third was an experimental field on the crown lands at Petergrof, near Riga. Of recent years the number of stations has multiplied quite fast, and the support of the stations given by the government has been liberally increased. Three new crown stations were established last year, at Shatil, Batischevo, and Valuiki. The list of stations given in the volume includes 13 imperial stations, 23 subsidized institutions, and a large number of special stations engaged in work on some particular crop or animal. The work at many of the institutions is quite specialized. Some, for instance, are studying irrigation primarily, others viticulture, flax culture, tobacco culture, plant breeding, and agricultural bacteriology, and a number are devoted to fish culture and to sericulture.

The yearbook emphasizes the necessity of more extensive study ot some of the leading problems connected with agricultural practice in different parts of the Empire. The results already obtained lead the authors to regard this class of institutions as of very great importance to the national prosperity, and to hold a very optimistic view of the future prospects for the work.

CONVENTION OF ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

D. J. Crosby,

Office of Experiment Stations.

The Association of American Agricultural Colleges and Experiment Stations held its sixteenth annual convention in Atlanta, Georgia, October 7 to 9, 1902. There was an enrollment of 135 delegates and visitors, including representatives from all but 7 of the States and Territories. Addresses of welcome were delivered by Hon. Livingston Mims, mayor of Atlanta, and ex-Governor W. J. Northen, and a response on behalf of the association was made by G. W. Atherton. The citizens of Atlanta were very cordial in their welcome to the delegates and visitors, and arranged for them two delightful entertainments on the afternoon and evening of the second day of the convention. The afternoon entertainment consisted of a trolley ride to the Georgia School of Technology and other points of interest in the city, ending with a luncheon served at the Piedmont Driving Club. In the evening the members of the association were given an informal reception and luncheon at the Carnegie Library by Miss Anne Wallace, librarian. On the following day the association adjourned at noon in order that the delegates might visit the Georgia Experiment Station, near Griffin. Following the final adjournment of the association, many of the delegates took advantage of excursions that had been arranged for them to Tuskegee, Chattanooga, Asheville, and other points.

The second annual meeting of the American Horticultural Inspectors was held in Atlanta beginning October 6, and several sessions of the meeting were held in conjunction with the section on entomology of the association.

GENERAL SESSIONS.

The day sessions of the association were held in the State Capitol, the evening sessions in the ballroom of the Kimball House. The general sessions were presided over by Pres. W. M. Liggett, of the University of Minnesota, who delivered the annual presidential address on the first evening of the convention. The subject of the address, Agricultural Education, gave opportunity for discussing briefly all the important agencies for the promotion of instruction and research in agriculture. While recognizing the varying needs of different sections of the country as to ways and means for accomplishing the best results, the speaker emphasized the fact that in discussions of this kind geographical lines must be wiped out and a free interchange of ideas be encouraged. Efficiency and ability to do were set as the goal to be attained in any system of education, and these are attained quite generally in agricultural education. A review was given of the progress made in various lines of industrial education, including that of the agricultural colleges and experiment stations, agricultural high schools, short courses, farmers' institutes, and the Graduate School of Agriculture at Columbus. The speaker also emphasized the importance of giving attention to elementary instruction in agriculture in the rural schools. The need of adjusting the relation of instruction to research was pointed out, and two institutions were mentioned as important agencies in this connection—the Graduate School of Agriculture, to train teachers and investigators; and the Carnegie Institution, to provide for and aid research, to furnish conditions necessary for the development of science.

An address on Education at Tuskegee was presented in a general session by G. W. Carver, director of the agricultural department of the Tuskegee Normal and Industrial Institute. He reviewed the work of the institution, gave a general idea of its extent and equipment, and pointed out in an interesting way the different lines of instruction open to the children of the colored race, and the lines of demonstration in agriculture undertaken for the instruction of farmers who visit the institution. The association extended a vote of thanks to Professor Carver for his address.

Dr. Daniel Morris, Commissioner of Agriculture, Imperial Department of Agriculture of the British West Indies, and William Fawcett, Director of the Department of Public Gardens and Plantations, Kingston, Jamaica, attended the sessions of the convention; and upon invitation from the association, Dr. Morris made a short address, in which he thanked the association for courtesies shown him and his colleague and expressed a desire on the part of the Imperial Department of Agriculture of the British West Indies to cooperate with the United States Department of Agriculture in promoting agricultural education and research in the West Indian possessions of the United States.

The report of the executive committee was presented by H. H. Goodell, chairman. The committee recommended (1) renewed efforts for the establishment of colleges of mining; (2) revision of Circular No. 34 of the Office of Experiment Stations, Rules and Apparatus for Seed Testing, by the committee that prepared the circular, with such additions as may be necessary to fill vacancies; (3) that the association instruct its executive committee, or appoint a special committee, to communicate with the War Department and request some modification of its recent order increasing the amount of military instruction in the land-grant colleges; and (4) that the Graduate School of Agriculture be continued, the association to assume the necessary expense of maintenance, less such amount as may be voluntarily contributed by the institution at which the school is from time to time held, this expense to be met by assessments upon the colleges and universities represented in the association in proportion to the income of these institutions, provided that assessments may take the form of scholarships to be maintained in the name of the contributing institution. The report was adopted, and E. Brown and A. D. Shamel were appointed members of the committee to revise Bulletin No. 34 of this Office, in place of G. H. Hicks and Gerald McCarthy, deceased.

The report of the treasurer, E. B. Voorhees, showed cash on hand $78.40, bills payable $271.04, deficit $192.64.

The report of the bibliographer, A. C. True, noted especially the marked increase in the number of publications reviewing literature along general lines, such as chemistry, plant protection, and veterinary medicine, and called attention to the number (over 100) of partial bibliographies and reference lists along lines related to agriculture. Mention was also made of the preparation of an international catalogue of scientific literature in 17 branches of science, work upon which was undertaken in 1901.

The report of the section on horticulture and botany was presented by the chairman, John Craig. It included the report of a somewhat extensive inquiry regarding the trend of efforts on the part of teachers and investigators in horticulture and botany. It showed the tendency in horticultural teaching to be toward an increase of laboratory and field work; in horticultural investigation, toward an increase of cooperative work. Teachers of botany, he found, were making progress toward more clearly differentiating the different branches of the study. The majority of them considered physiological botany of greater relative importance than systematic botany. Investigators in botany are of the opinion that cooperation between botanists is feasible, but are doubtful whether the same is true between botanists and farmers.

A report on the Graduate School of Agriculture at Columbus was given by A. C. True, dean of the school. The school opened July 7 and continued four weeks, closing August 1. The faculty included 35 men, drawn from agricultural colleges, this Department, and the New York State Station. Seventy-five students were in attendance. These were drawn from 28 States and Territories, from Canada, and from Argentina. Twenty-seven of the students are professors or assistant professors of agriculture in agricultural colleges, 31 are assistants in the agricultural colleges and experiment stations, 9 are recent college graduates, and 8 are engaged in farming. The expense of the school was $3,945.12. The income from fees was $450, leaving a net cost of $3,495.12, which was borne by the Ohio State University.

The report of the committee on indexing agricultural literature, presented by A. C. True, chairman of the committee, included a statement regarding the work along this line accomplished by the Department of Agriculture during the year, including the card index of experiment station literature, published by this Office, and card indexes of Department publications prepared by the Librarian of the Department. Attention was called to the increasing amount of indexing necessary to keep up with Department publications and to the lack of sufficient funds for accomplishing this work. It was stated that the Librarian of Congress would cooperate to the extent of printing index cards from this Department as a part of the index issued by the Library of Congress. In order to prepare the copy for these cards, additional help is needed in the Department Library, and the committee recommended that the executive committee of the association make an effort to secure from Congress an appropriation of $2,500 to carry on the work.

A lively discussion was precipitated by the reports of the two committees appointed to consider the matter of making exhibits from the land-grant colleges at the St. Louis Exposition. Both the committee on collective college and station exhibit and the committee on cooperative college exhibit (mechanic arts) favored making exhibits at St. Louis, but the latter committee reported in favor of a combined effort to project a comprehensive exhibit of the entire work of the colleges and stations. After considerable discussion the matter was referred to the two committees, who later reported in favor of a unified exhibit of the distinctive features of college and station work, to be in charge of one committee consisting of the members of the two committees already appointed, and asked the executive committee to make an effort to secure from Congress an appropriation of $60,000 for installing and maintaining the exhibit. This report was adopted and H. W. Tyler, of Massachusetts, was appointed a member of the committee in place of J. H. Washburn.

The report of the committee on graduate study at Washington was presented by A. C. True. Progress in this work has been very limited, owing to the complications arising from the establishment of the Carnegie Institution. No effort has been made to secure opportunities for graduate study in any of the Departments except the Department of Agriculture, which, however, has considerably broadened its work and made more general use than formerly of the register for scientific aids.

H. J. Wheeler presented the report of the committee on uniform fertilizer laws, which included a statement of the work done during the year in the way of distributing circulars for the purpose of securing greater uniformity. It was recommended that persistent and continued efforts be continued along these lines, and that the functions of the committee be enlarged so as to include feeding stuffs. The report was adopted.

The report of the committee on methods of teaching agriculture was presented by A. C. True. The report included a brief account of the Graduate School of Agriculture, at Columbus, a statement that a report on facilities for teaching agronomy would soon be published, and an account of work undertaken by the committee for the promotion of secondary agricultural education. The demand for secondary agricultural education and the inability of existing institutions to fully meet that demand were pointed out. The committee therefore undertook to show how, with very little rearrangement, courses of study in the public high schools could be adapted to the needs of the pupils desiring instruction in agriculture. This report has been prepared for publication and will be issued at once as a circular of this Office.

The report of the committee on pure-food legislation was presented by the chairman, W. A. Withers, who stated that there was a growing sentiment in favor of pure-food legislation, but a lack of agreement regarding the machinery for the enforcement of regulations. He recommended continued efforts for the promotion of pure-food legislation.

No report was presented by the committee on cooperation between the stations and U. S. Department of Agriculture, but W. J. Spillman spoke briefly in this connection regarding the cooperative work with which the Bureau of Plant Industry is concerned.

W. M. Hays, chairman of the committee on animal and plant breeding, reported progress. The committee met at Columbus in July and recommended the organization of the Plant and Animal Breeders' Association. The report recommended that the committee be continued and authorized to call a conference at the next meeting of this association to organize a plant and animal breeders' association to meet for the first time in 1904.

For the committee on designation of substations and trial stations, W. M. Hays reported progress and recommended that the committee be continued in order that it might confer with the Department of Agriculture regarding the nomenclature of such institutions.

A resolution introduced by E. Davenport, and adopted by the association, indorsed the plans of the Secretary of Agriculture for the promotion of farmer's institutes throughout the country, and pledged the active cooperation of the association in efforts to secure adequate financial support for this enterprise. A resolution calling on the executive committee to use its influence with Congress to secure the regular and prompt publication of the Annual Report of the Office of Experiment Stations was introduced by H. J. Wheeler and adopted by the association.

W. H. Jordan introduced a resolution urging upon the trustees of Carnegie Institution the importance of agricultural science to the national welfare, and expressing the hope that the magnificent gift of Hon. Andrew Carnegie may be used in some measure to promote investigation touching the relations of the sciences to agriculture. The resolution was adopted, and on motion of H. H. Goodell a special committee, consisting of W. H. Jordan, H. C. White, and T. F. Hunt, was appointed to present the matter to the trustees of Carnegie Institution.

A committee consisting of H. E. Alvord, J. L. Snyder, W. A. Henry, C. F. Curtiss, and W. M. Hays, reported brief resolutions on the death of President William Le Roy Broun, of the Alabama Polytechnic Institute, and President W. M. Beardshear, of the Iowa State College of Agriculture and the Mechanic Arts, and recommended that the committee be continued, with authority to invite suitable persons to deliver brief addresses at the next convention of the association, commemorative of the deceased presidents.

A resolution, introduced by E. Davenport and adopted by the association, provided that the executive committee urge upon Congress that it increase the appropriation for each agricultural experiment station by the sum of $15,000 annually if in the opinion of the committee such action would be expedient.

In accordance with a resolution introduced by A. R. Whitson and adopted by the association, the following committee on agricultural engineering in land-grant colleges was appointed: W. E. Stone, A. R. Whitson, C. S. Murkland, S. Fortier, and Elwood Mead.

On motion of the secretary of the association the assessment for each institution represented in the association was fixed at $15 for the ensuing year.

Amendments to the constitution, introduced by W. A. Henry, provide for doing away with the present sections of the association and dividing it into two sections—one on college work and administration, the other on experiment station work. The amendments further provide that no action on public and administrative questions shall be final without the assent of the section on college work and administration.

The following officers were elected for the ensuing year:

President, J. K. Patterson, of Kentucky; vice-presidents, R. H. Jesse of Missouri, W. E. Stone of Indiana, T. H. Taliaferro of Florida, C. C. Thach of Alabama, and J. W. Heston of South Dakota; secretary and treasurer, E. B. Voorhees, of New Jersey; bibliographer, A. C. True, of Washington, D. C.; executive committee, H. C. White of Georgia, W. O. Thompson of Ohio, W. H. Jordan of New York, and C. F. Curtiss of Iowa.

Section on agriculture and chemistry.—Chairman, C. G. Hopkins, of Illinois; secretary, J. F. Duggar, of Alabama.

Section on horticulture and botany. Chairman, H. L. Bolley, of North Dakota; secretary, H. H. Hume, of Florida.

Section on entomology. Chairman, A. L. Quaintance, of Maryland; secretary, V. H. Lowe, of New York.

Section on mechanic arts. Chairman, F. P. Anderson, of Kentucky; secretary, W. M. Riggs, of South Carolina.

Section on college work.—Chairman, E. R. Nichols, of Kansas; secretary, J. W. Heston, of South Dakota.

MEETINGS OF SECTIONS.

SECTION ON AGRICULTURE AND CHEMISTRY.

In this section the investigation of feeding problems was discussed from two points of view. H. P. Armsby discussed the practical value of respiration calorimeter experiments, and C. F. Curtiss the scientific value of large-scale feeding experiments. The former took the position that the question as to the practical value of experimental work is a pertinent one and that the experiments should show indication of ultimate practical bearing. In this broad sense he considered experiments with the respiration calorimeter practical. In his opinion every experiment should be scientific in methods and practical in aim. Some of the things that he considered possible to determine with the respiration calorimeter were (1) what relation does extra energy (over maintenance ration) bear to energy stored up, (2) proportion of available energy in different classes of feeding stuffs, (3) influence of age and condition of animals, and (4) influence of varying the amount of food given to a dairy cow. He thought there was urgent need of collecting data on the available energy in different feeds, and emphasized the general importance of more scientific station work—of getting at principles. C. F. Curtiss agreed with the former speaker that it is important to arrive at scientific principles first, but contended that these principles should then be applied. In the application of these principles he had found that some difficulties attending experiments with the respiration calorimeter, such as individual variation, could be overcome by means of experiments on a large scale. He noted a dangerous tendency on the part of the public to accept the results of experiments too readily—before they had been verified. His experience had taught him that the theories of stock feeders are not all reliable when applied to farm practice, and he emphasized the importance of experimenting with large numbers and verifying first results by repetition of the experiment if necessary.

Some of the beef problems of the South and what the stations can do toward solving them was discussed by A. M. Soule, C. W. Burkett, D. W. May, and J. C. Robert. All of the speakers agreed that beef production in the South can be made both feasible and profitable; some even went so far as to say that beef could be produced in the South more cheaply than in any other section of the country. There was also a general agreement on the proposition that animal husbandry will be the most efficient means for restoring fertility to Southern soils, and that it should become in the near future one of the important industries of that section. The principal drawbacks to successful beef production in the South were said to be the prevalence of Texas fever and the lack of permanent pastures, of well-bred cattle and of knowledge among the farmers regarding the rudiments of stock raising.

J. C. Robert gave interesting data regarding Texas fever and outlined a method for eradicating it by ridding the entire country of the cow tick. This could be done, he said, by concerted effort on the part of stock raisers along the quarantine line to rid every animal of ticks and, by practicing a rotation of pastures, to keep cattle off infested pastures until the ticks have disappeared, which would require from 8 to 12 months. In this way the quarantine line could be gradually moved southward until the whole country was freed of ticks. The speaker also emphasized the importance of developing a better market for beef cattle and of establishing slaughterhouses in the South.

A. M. Soule gave figures showing the number of cattle in the Southern States and the value of the same. He also showed that many of these cattle leave the South as stockers and feeders and are fed in the North. He contended that they should be fed in the South, that the cotton-seed meal should be utilized as a cattle feed, and that sufficient roughage to go with the cotton-seed meal could be cheaply produced. He quoted figures to show that at the Tennessee Station roughage, including silage, has been produced at a cost of $1.23 per ton.

D. W. May gave emphasis to the statement that the South has the advantage of a larger variety of forage crops, a longer grazing season, and less need of providing shelter than any other section of the country. He also emphasized the importance of stamping out Texas fever and of improving the herd by the introduction of more well-bred sires. Recent investigations had led him to believe that the influence of good bulls could be greatly extended by practicing artificial impregnation which has proven successful in practice among horse breeders. He had found that one drawback to this practice, the death of spermatozoa due to the fermentation of semen, can be avoided by the use of a little glycerin. In this way he kept spermatozoa alive and active 10 hours in a room at a temperature of 67° F. and 30 hours in a temperature of 90° F. He also found that the semen could be diluted and the spermatozoa kept alive several hours.

C. W. Burkett had found the cotton crop to be the great hindrance to the introduction of animal husbandry. The people must be shown, he said, that animal husbandry is profitable to cotton production. He considered Bermuda grass one of the best grasses for the establishment of permanent pastures. He also considered it important to secure better bred cattle by the use of pure-bred bulls on native stock and to educate and train stockmen.

C. G. Hopkins discussed the possibilities in plant breeding and selection, considering chiefly the question of breeding and selecting corn for different purposes, that is, for high or low protein content, high or low starch content, and high or low oil content. He showed that a small change in any one of these constituents, if fixed by breeding and selection, would have a great influence on the market price of corn. J. T. Willard emphasized the importance of basing investigations on the real needs of the section of the country in which they are undertaken, and called attention to the fact that a variety bred up to meet a certain demand in one section of the country is quite apt to prove a failure from the same point of view in another section. He considered it important that stations encourage local effort in this connection, and that they devote themselves to problems of economic importance rather than to fanciful features. The papers were discussed with a great deal of interest by Dr. D. Morris, E. Davenport, W. J. Spillman, and others.

The Source of Carbohydrates for the South for the Production of Meat was the subject of papers by W. J. Spillman, J. F. Duggar, and R. J. Redding. The latter paper was read only by title. The two speakers were in practical agreement in nearly every point of their discussion. They brought out the fact that in the South carbohydrates are more expensive than in the North, and that the production of them to supplement nitrogenous feeds is an important problem. Among the things suggested for introduction and test were cowpeas, corn, sorghum, Kafir corn, millo maize, teosinte, cassava, sweet potatoes, peanuts, Bermuda grass, crab grass, and the by-products of rice.

SECTION ON COLLEGE WORK.

A. C. True, of this Office, presented a paper on The Graduate School of Agriculture as a Means of Improving the Pedagogical Form of Courses in Agriculture, in which he showed the existence of one of the elements which are considered necessary to pedagogical form, namely, a body of knowledge regarding the subject under consideration. Some of the other elements, such as the arrangement in progressive order of the topics selected to be taught, appropriate apparatus, illustrative material, text-books, and works of reference, he found to be inadequate. He showed, however, how the Graduate School of Agriculture might be expected to result in greatly improving these conditions, how it might result in better agreement among educators regarding topics to be taught and the order of treatment, how the excellent apparatus found at Columbus had furnished many suggestions for improving the apparatus in other institutions, and how already a movement has been started to put in printed form some of the lectures there delivered. He noted as an encouraging indication the organization of agricultural faculties with special teachers for different divisions of the subject of agriculture, instead of, as formerly, a number of teachers presenting the sciences related to agriculture. As a result of these changes there has been great stimulation of a proper sense of the dignity of the profession of agriculture and agricultural teaching. The paper was discussed by T. F. Hunt, who summarized his views in the statement that the men engaged in agricultural work are able executives, many are able in research, but there are not so many who employ the best pedagogical methods. He considered it as important to prepare for the profession of teaching in agriculture as to prepare for executive duties or research work. J. F. Duggar had found the Graduate School of Agriculture valuable to the teacher in the suggestions it gave for methods of instruction and for making apparatus. The school, he said, was also valuable in that it reduced differences and misunderstandings among educators.

A paper on Agricultural Education in the South was presented by J. C. Hardy, who first reviewed agricultural conditions in the South from the earliest times to the present and showed what influences had been detrimental to the development of educational institutions in that section. The South, he said, has taken advantage of the provisions for land-grant colleges and experiment stations, but as yet there are few agricultural books and papers and comparatively few who would read them. The work of college and station men in farmers' institutes during the last few years he has found one of the most potent factors in arousing greater interest in educational institutions and in securing more funds. He quoted figures to show how quite recently the people in different Southern States have provided liberal appropriations to supplement Government funds for the support of agricultural institutions. In discussing this paper, C. C. Thach stated that the agricultural and mechanical colleges have been one of the strongest agencies in eradicating the prejudice against manual labor, and quoted figures from the report of the Bureau of Education to show that at the present time there is a larger percentage of students taking agriculture in the land-grant colleges of the South than in the land-grant colleges of the North. He also emphasized the importance of the work being done by the experiment stations and of farmers' institute work.

A carefully prepared paper on Military Instruction in Land-grant Colleges was presented by J. W. Heston, who pointed out the fact that heretofore military instruction has suffered from lack of definiteness in the instructions sent out from the War Department. An investigation of the conditions of military instruction in different land-grant colleges showed great diversity in the extent and quality of instruction required. He thought it desirable to strengthen military courses somewhat, and emphasized the importance of target practice and camp life in a system of military instruction. He would have military instruction required for 5 hours a week during 2 years of the collegiate course. Speaking of the recent order from the War Department, he pointed out that in his judgment it is utterly impracticable to meet the requirements of that order, and in this position he was supported by C. W. Dabney, G. W. Atherton, H. E. Alvord, and others who discussed the question. Some means of bringing the matter to the attention of the War Department was sought and finally, by vote of the section, it was decided to refer it to the standing committee of the association on military instruction in land-grant colleges, with the request that the committee confer with the Secretary of War and immediately thereafter report the results of the conference.

SECTION ON ENTOMOLOGY.

In this section three subjects of general interest were discussed. The discussion on excellencies and defects of existing legislation for the control of insects and fungus pests was opened by S. A. Forbes, who reviewed and compared the requirements of inspection laws in different States and gave special attention to the California law. In the discussion which followed quite a number of the members of the American Horticultural Inspectors' Association participated, explaining the requirements under which they were operating in different States. In this connection it is interesting to note that the horticultural inspectors appointed a committee of three to attempt to harmonize these laws—that is, to draw up a uniform law that could be recommended for all the States.

J. B. Smith discussed recent observations and experiments with insecticides for the San José scale, reviewing in a general way recent experiments along that line. In this discussion and in that by other members of the section the consensus of opinion seemed to be that crude pretroleum, kerosene, and lime, salt and sulphur constitute the standard remedies for San José scale. The latter remedy has not been tried with success in the East until quite recently.

Cooperation in making insecticide tests was the subject of a discussion opened by H. T. Fernald, in which it was generally agreed that cooperation is desirable and that cooperators should agree on certain investigations along well-determined lines.

SECTION ON HORTICULTURE AND BOTANY.

Owing to the small attendance in this section only three of the papers on the programme were read. A paper by A. D. Selby on The Need of Better Courses of Preparation for Work in Applied Botany was read by the secretary. The writer regretted the fact that there is no provision in the curricula of agricultural colleges for teaching vegetable pathology and that little attention is given to vegetable physiology. The paper read by E. M. Wilcox on Plant Pathology and Physiology in College Curricula was along the same general lines. He gave statistics showing the lack of courses in these subjects in about 120 educational institutions in this country. The papers were discussed by F. W. Rane, H. L. Bolley, and others. On motion of F. W. Rane a committee was appointed to formulate desiderata for courses in botany for students in agricultural colleges, including supplementary chemistry, etc., and to report at this section next year. The chair appointed as members of this committee A. F. Woods of the United States Department of Agriculture, F. A. Waugh, and A. D. Selby.

A paper by L. H. Bailey on The Editing of Experiment Station Publications was read by the secretary. The writer urged that an editor is needed for experiment station literature, because no matter how accurately an investigation is conducted, it "fails of its purpose when it does not reach the popular audience for whom it is intended, and it reaches this audience more because of its literary and typographical form than because of its scientific contents." Among the faults commonly found in station publications, the writer mentioned lack of coordination, too much preamble, long and involved sentences, and attempts at fine writing. He urged that the papers should be progressive and cumulative and that all secondary and incidental details be sacrificed for the sake of brevity.

The papers in the hands of the secretary, which were read only by title, were as follows: Lines of Experimentation Invitingly Open to Station Botanists, L. H. Pammel; Plant Breeding to Secure Resistant Forms, E. M. Wilcox; Some Peculiar Needs in New States, (a) Home Adornment, (b) Home Production, A. Nelson; Variety Tests in Florida, H. H. Hume; Bulletin Illustration, F. A. Waugh; How Far Should the Experiment be Followed by Educational Effort on the Part of the Experimenter, H. L. Bolley.

SECTION ON MECHANIC ARTS.

The subjects discussed in this section were in the main closely related to problems of interest in the South. W. M. Riggs, in his paper on Methods of Conducting Engineering Laboratory Work, described the methods as they now exist and emphasized the importance of giving more time to laboratory work and of placing more responsibility on the student, with a view to making him more self-reliant.

The Power Question in the South was discussed by C. M. Strahan. The question discussed was whether the development of water power should be favorably considered as against steam power. The speaker favored water power on account of the high price of coal and cited statistics to show that water could be relied upon to manufacture the whole cotton crop of Georgia.

In a paper on Sugar Engineering, T. W. Atkinson described the course of study as it is arranged at the Louisiana State University and Agricultural and Mechanical College. He also described the processes involved in the manufacture of sugar.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The nucleic acid of the wheat embryo, T. B. Osborne and I. F. Harris (*Connecticut State Sta. Rpt. 1901, pt. 4, pp. 365–430*).—An extended study of the nucleic acid in the wheat embryo, the discovery of which was announced in the report of the station for 1899 (E. S. R., 12, p. 512), is reported. The literature of nucleic acid is reviewed at length, and the methods used in the preparation and analysis of the nucleic acid studied, to which the name tritico-nucleic acid is given, are described in detail. The authors' conclusions are given below in full:

"(1) The embryo of wheat contains a relatively considerable quantity of nucleic acid, for which the name tritico-nucleic acid is proposed. About 3.5 per cent of the commercial embryo meal used in this investigation probably consisted of tritico-nucleic acid.

"(2) On keeping, the meal undergoes a change so that the unaltered nucleic acid is obtained from it in diminished quantity or not at all.

"(3) Tritico-nucleic acid has the properties of the true nucleic acids of animal origin, but is less soluble in water.

"(4) Its composition corresponds to the formula $C_{41}H_{61}N_{16}P_4O_{31}$. It forms acid salts with potassium, sodium, or ammonium, which are readily soluble in water with a strongly acid reaction to litmus. In consequence of this, it is impossible to make preparations of the acid wholly free from base. The lack of agreement between the analyses of nucleic acids, heretofore published, is largely due to this fact.

"(5) On hydrolysis with acids, tritico-nucleic acid yields 1 molecule of guanin, 1 of adenin, 2 of uracyl, and 3 of pentose for every 4 atoms of phosphorous, and also an unidentified basic body.

"(6) Silver tritico-nucleotinate contains 6 atoms of silver for every 4 of phosphorus, from which the free acid is supposed to contain 6 hydroxyl groups.

"(7) The constitution of tritico-nucleic acid may be represented by the union of four $P(OH)_5$ groups, in which the 4 atoms of phosphorus are united by 3 of oxygen, and all but 6 of the remaining 14 hydroxyls are substituted by the groups named, thus forming a complicated ester of pentahydroxyl phosphoric acid, an acid unknown in the free state, but which Stokes has shown forms stable esters.

"(8) By a brief hydrolysis with dilute acids, all the guanin and adenin are split off and, at the same time, about one-fourth of the phosphorus appears as orthophosphoric acid. By dilute alkalies, the purin bases are not easily split off, but orthophosphoric acid is rapidly and abundantly formed.

"(9) After a brief hydrolysis, in acid solution, a complicated phosphoric acid remains which contains no guanin or adenin and only 2 pentose groups for every 3 atoms of phosphorus. The composition of its barium salt indicates that it may be formed from the nucleic acid by splitting off 1 of the phosphorus atoms, to which are attached the guanin, adenin, and 1 pentose.

"(10) Tritico-nucleic acid resembles the nucleic acids of animal origin, in that it contains the purin, pyrimidin and carbohydrate groups, together with phosphorus. The purin groups are the same in the animal and vegetable acids, but in the former the pyrimidin and carbohydrate groups are represented by thymin and hexose, in the latter by uracyl and pentose.

"(11) Tritico-nucleic acid closely resembles, and may be identical with, the nucleic acid of yeast, since both contain uracyl and a pentose and appear to have the same ultimate composition.

"(12) Tritico-nucleic acid resembles guanylic acid, in that both may be represented as complicated esters of a phosphoric acid formed by the union of four $P(OH)_5$ groups, but otherwise they present marked differences, which indicate different physiological relations.

"(13) The conception of tritico-nucleic acid as an ester of pentahydroxyl phosphoric acid suggests a chemical relation that may possibly exist between paranucleic acid and the true nucleic acids, for the organic part of the paranuclein of egg yolk, as one of us has previously shown, has nearly the same composition as that of the organic part of the paranucleo-proteid from which it originated, as is seen when the analyses are calculated PO_4 free. (Four $P(OH)_5$ groups united by 3 oxygen atoms contain $P:O::1:4\frac{1}{4}$).

"(14) The protein compounds of nucleic acid may be regarded as protein nucleates, those containing but little nucleic acid united with much protein forming the nucleoproteids, those with much nucleic acid and little protein forming the nucleins. The proportion in which the protein and nucleic acid unite is determined by the relative proportion of bases and acids present in the solution at any given time."

The ash constituents of plants, their estimation and their importance to agricultural chemistry and agriculture, B. Tollens (*Jour. Landw., 50 (1902), No. 3, pp. 231–275*).—This is a revised reprint (in German) of an article published in the Record (13, pp. 207, 305).

On the determination of phosphoric acid in plants, G. Sokolov (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 2 (1901), No. 6, pp. 770–779*).—The investigations reported in this article relate especially to the determination of phosphoric acid in the ash of various kinds of wood. It was found that in case of woods ordinarily yielding an ash rich in lime simple incineration is the most satisfactory method of preparing material for the determination of phosphoric acid.

The chemical methods of determining the productiveness of soils as dependent upon phosphoric acid, K. K. Gedroiz (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 2 (1901), No. 6, pp. 745–769*).—Comparison of results obtained by means of chemical methods with those furnished by pot experiments on a number of different plants indicate that plants vary so much in their power of taking up phosphoric acid from the same soil that no one solvent can be relied on to measure the availability of this constituent for all plants. The author, however, considers the use of 2 per cent citric acid preferable to 2 per cent acetic acid proposed by Bogdanov for determining available phosphoric acid in the soil.

On the amount of 1 per cent hydrochloric acid required for the digestion of soils for analysis, P. Kossovich (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 2 (1901), No. 5, pp. 639–642*).—Tests of 5 very dissimilar soils using 10 gm. of the soil to 500 cc. and 1,000 cc. of 1 per cent hydrochloric acid, indicate that the smaller amount of acid is not sufficient in all cases, but that 100 times as much acid as soil should be used. The author recommends 50 gm. of soil and 5 liters of 1 per cent acid

On the question of the determination of humus in soils, P. Kossovich (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 2 (1901), No. 5, pp. 643–646*).—The author reports examinations of chernozem soils which show that such soils rarely contain carbonates in sufficient amounts to interfere with the determination of humus by combustion in oxygen.

The determination of lime and magnesia in water, A. Grittner (*Ztschr. Angew. Chem., 15 (1902), pp. 847–852; abs. in Chem. Centbl., 1902, II, No. 13, p. 857*).—

The author reports tests of the soap solution method for determining hardness and of the methods of Clark and Winkler. These methods are considered unreliable. Pfeiffer's modification[a] of Wartha's method is recommended.

The determination of nitric acid in water, R. Woy (*Ztschr. Oeffentl. Chem., 8 (1902), p. 301; abs. in Chem. Ztg., 26 (1902), No. 76, Repert., p. 251*).—The author describes a modification of Devarda's method (E. S. R., 9, p. 723), which, it is claimed, gives very accurate results.

The rapid estimation of boric acid in butter, H. D. Richmond and J. B. P. Harrison (*Analyst, 27 (1902), No. 315, pp. 179–182*).—The method as used by the authors is as follows: To 25 gm. of butter in a beaker is added 25 cc. of a solution containing 6 per cent of milk sugar and 4 per cent of normal sulphuric acid. The butter is melted, stirred well, and the aqueous portion allowed to settle for a few minutes, when 20 cc. is drawn off, brought to a boil, and titrated with half-normal soda solution, phenolphthalein being used as an indicator. Twelve cubic centimeters of glycerol is then added and the titration continued until a pink color appears. The difference between the 2 titrations, less the amount of alkali required by the glycerol, multiplied by the factor 0.0368 gives the amount of boric acid in 20 cc.; and this multiplied by 100 plus the percentage of water in the butter and the product divided by 20 gives the percentage of boric acid.

Determination of lecithin in milk, F. Bordas and S. de Raczkowski (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 26, pp. 1592–1594; Ann. Chim. Analyt., 7 (1902), No. 9, pp. 331–333*).—The determination of phosphoglyceric acid is recommended. The method is as follows: 100 cc. of milk is added to a mixture of 100 cc. of alcohol, 100 cc. of water, and 10 drops of acetic acid. The coagulum is separated by filtration and extracted with alcohol. The extract is evaporated to dryness and the residue taken up with ether-alcohol. After evaporation the residue is saponified with potassium or barium hydroxid and the soap decomposed with nitric acid. The filtrate from this is evaporated to dryness and the residue treated with concentrated nitric acid and potassium permanganate. The phosphate is then determined as magnesium pyrophosphate, which, multiplied by the factor 1.5495, gives the amount of phosphoglyceric acid in the original sample.

Department of chemistry, A. L. Knisely (*Oregon Sta. Rpt. 1902, pp. 53–59*).—This is a report of the chemist on the work done during the year and contains incomplete analyses of 14 samples of soil, determinations of soil moisture in 4 plats at different dates, and analyses of 3 samples of "red albumen," 2 of Paris green, 1 of mineral water, and 2 of blackberries.

On a new acid indicator, L. J. Simon (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 10, pp. 437–439*).—The properties of a new product, isopyrotritartaric acid ($C_7H_8O_3$), obtained by calcining tartaric acid with potassium bisulphate, are described.

A vacuum desiccator heated by regulated incandescent lights, A. Skita (*Chem. Ztg., 26 (1902), No. 77, p. 898, fig. 1*).

Agricultural chemistry in the nineteenth century, W. Frear (*Pennsylvania Dept. Agr. Rpt. 1901, pt. 1, pp. 664–669*).—A popular discussion of this subject.

BOTANY.

The relation of nutrition to the health of plants, A. F. Woods (*U. S. Dept. Agr. Yearbook 1901, pp. 155–176, pls. 7*).—An outline is given of some of the more important problems of nutrition in relation to the health of plants, and a discussion of the effects of soil conditions on plant growth, the functions of various chemical elements as constituents of plants, and the effect of overfeeding and overwatering on the general health of plants.

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[a] Ztschr. Angew. Chem., 15 (1902), p. 193.

Investigations on the utilization of ternary compounds by plants, P. Mazé (*Ann. Inst. Pasteur, 16 (1902), Nos. 3, pp. 195–232; 5, pp. 346–378*).—As a result of an extended series of experiments with peas, beans, lupines, peanuts, and corn, the author claims that the carbohydrate or the oleaginous reserves of the plant are utilized by being passed through a number of transformations which always result in the formation of alcohol. The author believes that the combining of the ternary carbohydrate compounds with the nitrogenous elements is brought about by the oxidation of the alcohol and its transformation to ethyl alcohol, but the evidence of this is not deemed sufficient for publication as yet.

In the second paper the author states that peas, when deprived of oxygen, transform the fermentable sugar into alcohol and carbonic acid, but do not utilize it for the construction of living tissue. If placed in favorable conditions, however, the plant exercises the same action on sugar and can utilize the alcohol for plant growth. In carrying on subsequent experiments it was found that these conclusions did not fully apply to yeasts, but were fully borne out by the fungus *Eurotiopsis gayoni*. This fungus not only ferments sugar with the same activity as yeast, but is able to develop in a mineral solution when alcohol or dextrose is added. These 2 methods of nutrition are, according to the investigations of the author, shown to be identical in principle. The assimilation of ternary carbon compounds derived from sugar is brought about through the utilization of aldehyde by the living plant. The alcohol which is formed by the plant is not used as such, but as aldehyde. The differences noted in the nutrition of the fungus are attributed to the presence of zymase, which is necessary for the assimilation of the carbon derived from sugar.

Cane sugar as a reserve material in phanerogams, E. Bourquelot (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 12, pp. 718–720*).—Investigations were made of a number of plants representative of those whose reserve material consists of starch, inulin, mannane, galactan, oil, etc. The author claims that 18 out of 20 species examined showed the presence of cane sugar in the portion of the plant examined. Continuing his observations he claims to have found cane sugar in carob beans, honey locust, onion, holly, *Aucuba japonica*, phellandrium, caraway seed, coriander, etc., and to have isolated the cane sugar from the mature seed of the honey locust, holly, lily-of-the-valley, Aucuba, and from the root of peony.

The starch of evergreen leaves and its relation to photosynthesis during winter, K. Miyake (*Bot. Gaz., 33 (1902), No. 5, pp. 321–340*).—An investigation was made of various evergreen trees and shrubs, in which it was determined that the starch content differs much according to the different species. Monocotyledons generally contain less starch than dicotyledons, gymnosperms, and pteridophytes, or in some species none at all was observed. The starch in evergreen leaves normally begins to decrease in November, reaching its minimum during January and the beginning of February, and begins to increase again at the end of February. The starch found in evergreen leaves in winter is generally limited in amount as compared with that observed at other times of the year, but in a few species of plants it was found quite abundant. Starch is formed by photosynthesis during winter in small amounts and is translocated during the same season. The majority of evergreen leaves in the northern part of Japan almost entirely lose the starch from the mesophyll and guard cells in winter. In the middle and southern part of Japan many evergreen leaves contain considerable starch in the mesophyll, although the amount varies with different species during the coldest part of the winter. The starch content of evergreen leaves is generally more abundant in spring than late in summer or early in autumn. The stomata of a number of evergreen leaves were found to be open during the winter. The entire absence of calcium oxalate crystals from the leaves during winter, as claimed by Lidforss, could not be verified.

Photosynthesis by green leaves in light rays of different wave lengths, A. Richter (*Rev. Gén. Bot., 14 (1902), Nos. 160, pp. 151–169; 161, pp. 211–218*).—

A review is given of the effects of different colored light on photosynthesis, and the author describes experiments with bamboo leaves placed for a time under colored screens which admitted different portions of light, and whose wave length was measured. As a result of all the experiments, which are reported at length, it is shown that the effect of light rays on the leaf is in proportion to the absorptive energy of the leaf and entirely independent of the part of the spectrum or of the wave length of the light rays.

The transformation of oil in seed during their germination, P. Mazé (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 5, pp. 309–311*).—Experiments are reported on the germination of the seed of castor bean and peanut, in which the transformation of the oil contained in the seed is shown. The experiments are believed to show that the increase in sugar and similar material which takes place during the germination of the seed is made at the expense of the oil.

The growth of alfalfa in noncalcareous soils, P. P. Dehérain and E. Demoussy (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 2, pp. 75–80*).—A report is given of experiments with alfalfa which was grown in soil which contained little or no lime. One sample of soil, which is designated as heath soil, contained a great amount of organic matter while the other soil was disintegrated gneiss. Each soil was free from carbonate of lime. The soils were placed in pots containing 3 kg. to which 3 gm. of potassium phosphate was added. In addition, different pots received varying amounts of carbonate of lime and some received an inoculation of garden soil. The results of the experiments show that the organisms which produce tubercles on the roots of the alfalfa were present in both soils. Their action was made more vigorous by the addition of lime. The inoculation with garden soil was followed with favorable results in the case of the growing of alfalfa, as also proved true for the growing of clover.

The comparative resistance to high temperatures of the spores and mycelium of certain fungi, Abigail O'Brien (*Bul. Torrey Bot. Club, 29 (1902), No. 3, pp. 170–172*).—The well-known fact that the spores of bacteria are more resistant to heat than the vegetative cells has led to an investigation of the general belief that the spores of fungi are better able to resist high temperatures than is the mycelium. The author experimented with *Aspergillus flavus*, *Botrytis vulgaris*, *Rhizopus nigricans*, *Sterigmatocystis nigra*, and *Penicillium glaucum*. These were grown on beet cylinders in test tubes and the mycelium was taken from the culture tubes within 2½ days after the fungus began to grow. The effect of temperatures of from 45 to 65° C. on the spores and mycelium of this fungus is shown. It was found that the mycelium of all the fungi, except Botrytis, gave vigorous fresh growth at 50° C. for exposures of 30 and 60 minutes. Both the spores and mycelium of Penicillium gave vigorous growth at 55° C. The germination of spores did not always vary as to the length of time of exposure. This is attributed to variation in the resistance of individual spores.

The digestion of mannane in the tubercles of orchids. H. Hérissey (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 12, pp. 721–723*).—Mannane, which exists in the pseudo-tubercles of many orchids, is said to be transformed into mannose under the influence of soluble ferments. This transformation may take place in the tubercle itself when the material is used for the development of the new plant. It is necessary to recognize, however, that the ferment is distinct from the reserve material upon which it acts.

The endophytic fungi of orchids, G. T. Grignan (*Rev. Hort.* [*Paris*], *74 (1902), No. 15, pp. 361–365*).—A discussion is given of the relations existing between certain fungi and some orchids, it having been claimed that a form of symbiosis existed between them. The author is led to doubt the accuracy of this contention and shows that the presence of the parasite is not necessary to the germination and growth of the orchids.

FERMENTATION BACTERIOLOGY.

Diagnosis of bacteria, T. Matzuschita (*Bacteriologische Diagnostik. Jena: Gustar Fischer, 1902, pp. 692, figs. 17*).—In the present volume the author presents a system of classification of bacteria, with special reference to their more conspicuous biological characteristics. The number of species considered in the volume is 1,525. Only bacteria are considered, no parasitic fungi belonging to other orders being treated. The bacteria are classified from a biological standpoint into 5 general groups: (1) Those which liquefy meat gelatin; (2) those which do not liquefy meat gelatin; (3) those which do not grow on meat gelatin at a temperature lower than 20° C.; (4) bacteria which have not been accurately described in the literature of the subject; (5) bacteria which have not been cultivated on artificial media.

The bacteria included under these general heads are further subdivided into aerobic and facultative aerobic and anaerobic forms. A further subdivision under these classes is based on the presence or absence of locomotor organs, these classes being divided again into groups which form spores and those which do not, and these groups in turn being still further subdivided into forms which stain by the Gram method and those which do not. Under each bacterial species considered by the author the method of growth, behavior, and appearance on various nutrient media are mentioned for purposes of identification of the species. The bacteria are futher classified in the second section of the volume on the basis of the material or location in which they are found. This classification is followed by a detailed key arranged for the purpose of assisting in the identification of species of bacteria.

Treatise of bacteriology, pure and applied to medicine and hygiene, P. Miquel and R. Cambier (*Traité de bactériologie, pure et appliquée a la médecine et a l'hygiène. Paris: C. Naud, 1902, pp. XVI+1060, figs. 224*).—In this volume the authors discuss the various subjects which relate to the morphology, biology, and cultivation of bacterial organisms. Pathogenic fungi and protozoa are excluded from this volume but will be discussed in a subsequent treatise. The work is divided into 4 parts, of which the first contains an account of the morphology and biology of bacteria, their resistance to physical and chemical changes, nutrient media, cultivation of bacteria under aerobic and anaerobic conditions, experimentation on animals, microscopic preparations, methods of staining bacteria in cultures, exudations and animal tissues, and optical apparatus necessary for studying bacteria. The second part contains a detailed discussion of the various pathogenic micrococci, bacilli, and spirilla, as well as an account of diseases due to unknown micro-organisms, and a consideration of the problems of virulence, immunity, and methods of immunization. In the third part of the volume the authors discuss zymogenic, chromogenic, and saprogenic bacteria. The fourth part is devoted to the application of bacteriology to hygiene and medicine, and contains a discussion of a bacteriological analysis of air, water, and soil, together with a general account of mechanical, physical, and chemical methods of disinfection. In connection with the discussion of pathogenic bacteria an account is presented of the virus and toxins of a number of diseases in which the micro-organism is not known. These diseases include influenza, aphthous fever, smallpox, cancer, pleuro-pneumonia, yellow fever, rabies, and syphilis.

The composition of the albuminoids and cell membranes of fungi and bacteria, K. S. Iwanoff (*Beitr. Chem. Physiol. u. Pathol. Ztschr. Biochem., 1 (1902), pp. 524–537; abs. in Bot. Centbl., 89 (1902), No. 17, p. 491*).—Studies are reported of *Aspergillus niger*, *Boletus edulis*, *Claviceps pupurea*, *Bacillus megatherium*, *B. anthracis*, and *Staphylococcus pyogenes aureus*, in which the albuminoids were found to contain 15 to 16 per cent of nitrogen and 0.75 to 2.25 per cent phosphorus. The large phosphorus content places the albuminoids of these plants among the nucleoproteids. The cell membranes showed a decided reaction of chitin, which agreed closely with that substance as known in animals. The methods of determination are fully described.

Denitrification, H. WEISSENBERG (*Centbl. Bakt. u. Par., 2. Abt., 8 (1902), pp. 166–170; abs. in Jour. Chem. Soc. [London], 82 (1902), No. 477, II, p. 470*).—A brief account is given of observations on the behavior of denitrifying organisms under different culture conditions.

Department of bacteriology, E. F. PERNOT (*Oregon Sta. Rpt. 1902, pp. 67–69*).—A brief report is given of experiments with cultures of bacteria in the preparation of vinegar from waste prunes and other fruits. The bacterial fermentation of corn silage was also investigated, and a number of cases of supposed bacterial diseases of animals are reported.

Report of the Moscow Bacteriological Agricultural Station for 1901, S. SEVERIN (*Rev. in Izv. Min. Zem., 1 (1902), No. 23, pp. 478, 479*).—An investigation was made of the bacterial preparation Alinit, and 2 organisms were isolated from it. These organisms were found to possess no property of increasing the yield of cereals. The experiments were carried out with the application of the dry cultures, as recommended by the distributers of Alinit. The station also made an extended study of the process of fermentation of the dough in the preparation of black bread. The stability of dry cultures and their resistance to winter temperature was also investigated. It was found that these cultures as prepared by the station do not retain their vitality longer than 4 months. They were not affected, however, by low temperatures, even when subjected to a temperature of −20° C. In addition to the above, the station reports investigations on the influence of micro-organisms on insects.—P. FIREMAN.

The relation between the so-called Alinit bacteria, Bacillus ellenbachensis, B. megatherium, and B. subtilis, B. HEINZE (*Centbl. Bakt. u. Par., 2. Abt., 8 (1902), Nos. 13, pp. 391–395; 14, pp. 417–425; 15–16, pp. 449–453; 17, pp. 513–519; 18–19, pp. 546–556; 20, pp. 609–626; 21, pp. 663–669*).—Comparative studies are reported on the relation between the organisms which are mentioned above. Their identity has been often claimed, and the author conducted a long series of cultures and experiments to ascertain their true relationships. A tabular summary is given, in which the more important biological phenomena of each species is shown. Based upon his observations, the author claims that in no case should the so-called Alinit bacteria be confused with *B. megatherium*, although agreeing in some superficial characteristics. The resemblance to the hay bacillus, *B. subtilis*, is still more remote.

Nitrogen assimilating bacteria, GERLACH and VOGEL (*Centbl. Bakt. u. Par., 2. Abt., 8 (1902), No. 21, pp. 669–674*).—Experiments are reported with a species of bacteria that is recognized as belonging to the group called Azotobacter by some authors. The species under investigation was isolated and cultivated for some time and culture media of known composition inoeculated with the organism. After 20 to 25 days the nitrogen content of the medium was determined, and in every case where inoculation material was used there was a decided gain in nitrogen. Greater gains were obtained where grape sugar was added to the nutrient medium than where it was displaced by calcium propionate.

Notes and observations on nitrifying bacteria, R. HELMS (*Agr. Gaz. New South Wales, 13 (1902), No. 2, pp. 215–222, pl. 1*).—Notes are given on agricultural bacteriology and its progress, and the action of nitrifying bacteria is described. The results of inoculation experiments with nitrifying organisms, as shown by the growth of wheat in pots, are given. Field experiments were conducted with the same organisms, but no definite results were obtained.

The aerobic retting of flax, L. HAUMAN (*Ann. Inst. Pasteur, 16 (1902), No. 5, pp. 379–385; L'Ing. Agr. Gembloux, 12 (1902), No. 11, pp. 513–516*).—The retting of textile plants is said to be the result of the action of micro-organisms which attack the pectic bodies constituting the middle lamella of the fibers, as well as the most of the parenchyma which surrounds the fibrovascular bundles. An examination of a number of samples of retted flax showed the presence of the following organisms: *Bacillus coli communis*, *B. mesentericus fuscus*, *B. fluorescens liquefaciens*, *B. mycoides*, *B. subtilis*, *B. termo*, *Streptothrix forsteri*, *Micrococcus roseus*, *Penicillium glaucum*, *Mucor mucedo*, and *Cladosporium herbarum;* together with the sterile mycelia of a number of fungi. Pure cultures were made of these different organisms and experiments conducted with them, together with other fungi, such as *Sclerotinia libertiana*, *Botrytis cinerea*, and *Aspergillus niger*. Of these the author found *Bacillus fluorescens* gave the best results, the Streptothrix attacked the fibers less rapidly, while *Micrococcus roseus* was the least efficient in retting the flax. His studies showed that these organisms act through the solution of the pectin in the flax, and in artificial solutions where pectate of lime was added the material was readily liquefied.

A variety of hog-cholera bacillus which closely resembles Bacillus typhosus, M. Dorset (*Abs. in Science, n. ser., 15* (*1902*), *No. 375, p. 370*).—A variety of hog-cholera bacillus, which was isolated from a virulent outbreak of hog cholera in Page County, Iowa, is described. This variety corresponded in every way with the typical hog-cholera bacillus, except in its fermentation of glucose without the evolution of gas. In this respect it resembles *B. typhosus* more closely than the hog-cholera group of bacteria. Examination of several cultures has shown that structurally this variety of hog-cholera bacillus can not be distinguished from some specimens of *B. typhosus;* but the author concludes that when the source and pathogenic properties are considered the organism should be classed among the hog-cholera bacteria.

Oysters and sewage in Narragansett Bay, C. A. Fuller (*Abs. in Science, n. ser., 15* (*1902*), *No. 375, pp. 363, 364*).—The sewage of the city of Providence, which amounts to about 14,000,000 gal. per day, is discharged into Narragansett Bay and is carried out by the tide, coming into more or less contact with some of the oyster beds. Samples of water and oysters were collected from different localities, and analyses made of the material while still quite fresh. The results showed that the water, oysters, mussels, and clams for a distance of a quarter of a mile from the sewer opening contained *Bacillus coli*, *B. cloacæ*, and *Bacterium lactis aërogenes*. The water and oysters from a bed 2 miles below the sewer contained the same organism. Thirty per cent of the oysters and about 60 per cent of the water samples from a bed situated in a strong tidal current 5 miles from the sewer contained *Bacillus coli*. Forty per cent of the oysters and 70 per cent of the water samples from a bed in sluggish water 5¼ miles from the sewer contained the bacteria, and oysters from a bed 6 miles away were also infested. Oysters from a bed 6½ miles below the sewer contained no colon bacilli, and the water contained specimens only occasionally, and then only when taken on a falling tide. Beds still farther down the bay were entirely free from contamination.

Preliminary observations on Bacillus coli communis from certain species of animals, V. A. Moore and F. R. Wright (*Abs. in Science, n. ser., 15* (*1902*), *No. 375, pp. 372, 373*).—A study has been made of *Bacillus coli communis* found in the large and small intestines of horses, cattle, sheep, swine, dogs, and chickens. The purpose of these examinations was to find the extent to which varieties of this bacillus exist normally in the intestines of different individuals of the same species, and of different species of animals. The object was to determine if the many varieties of the colon bacillus, which have been described from polluted water, soil, and from lesions of various kinds in man and animals, have their natural existence in the supposed normal habitat of this species of bacteria. The results showed no pronounced variation in the morphology or the cultural characters of these bacilli from different sources when grown on gelatin, agar, potato, and bouillon.

On the apparent identity of the cultural reactions of Bacillus coli communis and certain lactic bacteria, S. C. Prescott (*Abs. in Science, n. ser., 15 (1902), No 375, p. 363*).—While engaged in studying certain lactic bacteria the author noted the great similarity presented by some of the cultures to those of *B. coli communis*, and he has carried on investigations with a large number of lactic-acid-producing organisms, comparing their cultural reactions with those of the above species. Cultures were isolated from 47 different media. All of these were tested, and their growth and morphological characters noted. Of the 47 cultures examined, 25 gave typical colon reactions, 6 gave a weak response to tests, and the others failed. Regarding the source of these bacilli, the author suggests that they may be true colon bacilli from sources which can only be conjectured; or they may be lactic-acid organisms, not absolutely identical, yet almost impossible of differentiation from the colon bacilli. The latter view the author regards as the more probable. This work has a very practical sanitary bearing and seems to indicate that too much reliance can not be placed upon the so-called colon test of potable waters.

Toxicity of water toward pathogenic bacteria, H. L. Russell (*Abs. in Science, n. ser., 15 (1902), No. 375, p. 364*).—A preliminary report is given on the action of natural water on the vitality of various organisms, particularly pathogenic organisms. When typhoid and colon organisms were inoculated in boiled waters (surface, deep well, and spring) growth generally occurred. This was more marked with the colon than with the typhoid organisms, and was most pronounced where the seeding was light. When the same cultures were exposed to the action of water filtered through a Chamberland or Berkefeld filter, or to etherized water in which the anæsthetic had been removed by aspiration, growth not only did not take place but the numerical content was greatly reduced, so that the cultures became sterile within 24 hours. Tests showed that if filtered water was heated to 60° C. for 10 minutes it lost its toxic power. The origin of the toxic substances is ascribed to the development of water bacteria. After incubation for 33 days, this water was again filtered and found toxic for typhoid and colon bacteria, and upon heating it again lost its toxicity. Some bacterial species develop in standing water, seeming to indicate their ability to tolerate the toxins.

Effect of low temperatures of liquid air on pathogenic organisms, C. M. Belli (*Pub. Ist. Ig. Univ. Padova, 2 (1902), XII, pp. 7; extr. from Riforma Medica, XVIII, No. 19*).—An account is given of experiments with chicken-cholera bacilli and spore-bearing and nonspore-bearing forms of bacteria of carbuncle, which were subjected for 9 hours to the action of the temperature produced by liquid air. The results show that this temperature, which was about -190° C., not only checked the development of the bacteria but caused an actual diminution in the number of colonies present by destroying some of the least resistant.

On the germicidal action of the organic peroxids, F. G. Novy and P. C. Freer (*Abs. in Science, n. ser., 15 (1902), No. 375, pp. 365, 366*).—The authors have conducted a series of experiments with a view of ascertaining the correct explanation of the action of certain metals and of sunlight on bacteria. It is known that certain substances exert a marked effect upon the formation of benzoyl acetyl peroxid, and this served as a basis for the view that metals act upon bacteria by giving rise to energetic peroxids. In order to substantiate that theory the authors have investigated the action of a number of known organic peroxids, some of which have proved wholly inert, while others exert pronounced and remarkable germicidal properties. With reference to diacetyl peroxids and benzoyl acetyl peroxid, it is shown that these bodies are chemically and bacterially inert, but on contact with water they undergo hydrolysis and give rise to the extremely energetic acetyl hydrogen and benzoyl hydrogen peroxids. A solution of 1:3,000 of these is capable of destroying all pathogenic bacteria, and even some very resistant spores, within one minute. The germs of cholera and typhoid fever added to tap water are promptly destroyed by 1 part of peroxid to 100,000 of water. The powerful effects of the organic peroxids are believed to be due to the acetyl and benzoyl ions.

Tryptophane in proteolysis, S. H. Vines (*Ann. Bot., 16 (1902), No. 61, pp. 1–22*).—The author claims that the proteolytic enzym of Nepenthes, as well as those of the pineapple and the papaw, are essentially tryptic in their action. This is shown by the presence of a substance, known as tryptophane, among the products of digestion when tested by means of chlorin water. This substance is generally considered to be an indication of the disruption of the proteid molecules into nonproteid substances characteristic of tryptic digestion. In the present paper the author gives an extended account of his observations on the enzyms bromelin and papain, and describes experiments with the enzyms found in the fig, cocoanut, germinating seeds of beans and barley, of yeast, and of the bacteria of putrefaction, as well as with animal pepsin. Under appropriate conditions the presence of tryptophane among the products of digestion of fibrin and Witte-peptone was demonstrated. The production of tryptophane in the experiments outlined is held to bear out the author's opinion that proteolytic enzyms of plants in general are essentially tryptic. Until the existence of a peptic enzym is proved, the author claims that this statement will hold good. In respect to the action of the medium the vegetable enzyms may be taken to show affinity with pepsin on the one hand and trypsin on the other. In conclusion, the author adds a few words regarding the action of hydrocyanic acid in promoting proteolysis in plants. The general occurrence of this substance in plants has long been known, and it was once assumed to be present to afford protection to the plant, but recent experiments show that hydrocyanic acid is an early product in the nitrogen metabolism of the plant.

The symbiosis between Amylomyces and a species of Micrococcus, P. Vuillemin (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 6, pp. 366–368*).—A brief description is given of *Mucor rouxianus*, which is the ferment employed in the manufacture of certain Chinese food products. When cultivated on cooked rice at a temperature of 15° C. this mucor takes on a fine orange-yellow coloration which is due to the accumulation in the filament of a refracting product. In the older filaments a crystallization of this pigment may be observed. When the cultures are made at a temperature of 28° or more, the color produced is much paler. The author has found associated with this mucor an undetermined species of Micrococcus, and it is believed that the association of these 2 organisms is symbiotic through the Micrococcus attacking the carbohydrates and consuming the maltose, making it possible for the fungus to grow luxuriantly and produce the orange-yellow pigment which characterizes it.

The action of tannin and coloring matter on the activity of yeasts, A. Rosenstiehl (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 2, pp. 119–122*).—The action of tannin and coloring matter on the activity of yeasts used in wine making is described.

Notes on the enzyms of the Japanese sake-yeast, T. Takahashi (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 395–397*).—Since the occurrence of certain enzyms is said to be characteristic of certain yeasts and as the sake-yeast differs in its physiological and morphological properties from the common beer and wine yeasts, the author has made a study to ascertain the kinds of enzyms present. The methods of procedure are described, and as a result of his investigations the author claims that sake-yeast contains sucrase, zymase, trypsin, catalase, and peroxidase.

A new form of incubator and thermoregulator for bacteriological work, H. E. Ward (*Illinois Sta. Circ. 59, pp. 12, figs. 2*).—A new form of incubator is described which is believed to be better adapted to use in the laboratory than those generally employed. The method of heating is by means of incandescent electric lamps, and a more constant temperature may be secured. Variations of less than a half degree in 24 hours have been reported for this form of apparatus.

ZOOLOGY.

A biological investigation of the Hudson Bay region, E. A. PREBLE (*U. S. Dept. Agr., Division of Biological Survey, North American Fauna No. 22, pp. 140, pls. 14*).—In this report the author gives an account of a trip by water from Lake Winnipeg to the western shore of Hudson Bay, and also along the shore to a considerable distance north of Ft. Churchill. The author describes the general features of the country along the course of the trip and presents notes on the life zones and boundaries of the region as well as on the new species of mammals which were discovered. Annotated lists of the mammals, birds, and batrachians collected on the trip are presented, together with an extensive bibliography of literature relating to the biology of this region,

The prairie dog of the Great Plains, C. HART MERRIAM (*U. S. Dept. Agr. Yearbook 1901, pp. 257–270, pls. 3, figs. 2*).—The prairie dog is distributed throughout the Great Plains region from Montana to Texas. The average number per acre in infested localities is about 25, although much larger numbers are found in some places. In the southern part of their range they are seen nearly every day even in winter, but in Montana and Wyoming they hibernate for periods of varying length during the winter. Prairie dogs are able to live without drinking and therefore inhabit grazing lands far from any source of water. The usual number of young for each pair appears to be 4. The burrow may be dug to a depth of 14 ft. or deeper below the surface and is provided with horizontal apartments. The chief enemies of the prairie dog are the coyote, badger, black-footed ferret, and rattlesnake. Hawks and owls also destroy the young prairie dogs. This animal is increasing in many parts of the Great Plains. The remedies recommended for combating prairie dogs include poisoning with strychnin or cyanid of potash, and fumigation with bisulphid of carbon.

Killing woodchucks with carbon bisulphid, C. M. WEED (*New Hampshire Sta. Bul. 91, pp. 45–48*).—A number of experiments are reported, during which it was found that carbon bisulphid furnished a rapid and easy means of ridding cultivated fields of woodchucks. The experiments were conducted chiefly by A. F. Conradi, W. F. Fiske, R. A. Cushman, and P. A. Campbell. In nearly every case the treatment of a burrow with bisulphid of carbon resulted in the death of all the woodchucks contained in it.

The suslik in Germany, A. JACOBI (*Arb. K. Gesundheitsamte, Biol. Abt., 2 (1902), No. 4, pp. 506–511, fig. 1*).—A circular letter was sent out to various parts of Germany for the purpose of determining the distribution, prevalence, and other data of economic importance bearing upon this mammal. It was found that the suslik has become quite widely distributed throughout the German Empire. Considerable damage to various crops, especially cereals and legumes, is reported as due to susliks, and the use of bisulphid of carbon is recommended for destroying them.

The ravages of rabbits in Germany and experiments in their control, A. JACOBI and O. APPEL (*Arb. K. Gesundheitsamte, Biol. Abt., 2 (1902), No. 4, pp. 471–505, figs. 7*).—Detailed notes are given on the numbers of rabbits in various parts of Germany, and on the early history of the spread of these animals over the country. The chief injury from rabbits to which the authors devote their attention is the destruction of young trees. It appears that when the rabbits occur in large numbers and their food is scarce, all kinds of trees and shrubs are attacked without much indication of preference. Rabbits are said to eat the needles from young pine, or if pressed with hunger, they destroy the pines, wood and all. Other trees are attacked in a similar manner. In discussing the various methods of controlling these pests it is stated that the traps which have thus far been devised are not effective in localities where rabbits occur in large numbers. Extensive experiments were conducted with acetylene, Pictolin, and bisulphid of carbon. These substances were all applied as gases for the destruction of rabbits in their burrows. Acetylene was found to be ineffective. Pictolin is a mixture of sulphuric and liquid carbonic acids. When exposed to the air the substance volatilizes rapidly, and the experiments showed that it was fatal to rabbits. The application of this remedy, however, requires much time and is also expensive. It appears also to have an injurious effect upon the workmen. By far the best results were obtained by the use of bisulphid of carbon, which is recommended as the best substance for destroying rabbits in winter. It is urged also that attention should be given to the use of any remedy which has proved effective under local conditions in order to supplement the destructive effects of the bisulphid of carbon.

Combating the mouse pest by means of the mouse typhus bacillus of Mereshkowski, Y. KOZAI (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 299–322*).—The author conducted experiments in the use of the bacillus of Mereshkowski in destroying common field mice in the province of Ibaraki, northeast from Tokyo. The field mice upon which experiments were made belonged to the species *Arvicola hatanesumi*. Notes are given on the behavior and growth of the bacillus on various nutrient media. In preliminary experiments in the laboratory moistened buckwheat meal was infected with material from a bouillon culture of the bacillus of 24 hours standing. The moistened meal was readily eaten by the mice and all became infected with the disease without exception. Field experiments were then undertaken in a similar manner but on a larger scale. The infected material was placed in a field under piles of tobacco stems which were frequented by the mice. After a period of 5 days the burrows underneath the piles of tobacco stems were carefully investigated, with the result that of the 20 mice which were found in them 17 (85 per cent) had contracted the disease. A number of additional experiments were made along the same line, with quite promising results.

The resistance of rats and insects to carbonic and sulphurous acids, J. P. LANGLOIS and A. LOIR (*Compt. Rend. Soc. Biol. Paris, 54 (1902), No. 12, pp. 414, 415*).—The experiments were undertaken on account of the possible agency of these animals in distributing bubonic plague in cities. Carbon dioxid and the fumes of sulphurous acid were found to be of little value in destroying rats and insects.

Protection of useful birds, C. W. PETERSON (*Rpt. Dept. Agr. Northwest Territories, 1901, pp. 65, 66*).—Brief notes are given on the relation between insectivorous birds and agriculture. The agency of birds of prey in the destruction of gophers and other rodents is discussed, and notes are given on various means which must be adopted for poisoning these animals in case they are not held in check sufficiently by birds. Experiments were made in infecting wheat with pathogenic organisms for the purpose of spreading disease among gophers. It was found during these experiments that the bacilli of fowl cholera or mouse typhus could be relied upon to kill the gophers in an infected burrow, but that the disease did not spread rapidly from one burrow to another.

On the necessity for the preservation of our insect-destroying birds, with an alphabetical list of the principal kinds, C. FRENCH (*Jour. Agr. Victoria, 1 (1902), No. 1, pp. 69–73*).—The author gives brief general notes on the relationship of birds to agriculture, and presents a list of the principal insectivorous birds of Victoria.

Two vanishing game birds—the woodcock and the wood duck, A. K. FISHER (*U. S. Dept. Agr. Yearbook 1901, pp. 447–458, pls. 2, figs. 3*).—Attention is called to the great destruction of these birds in their winter home in the Southern States. No protection is offered to them there, and they are slaughtered in large numbers. Notes are given on the habits, distribution, and natural enemies of these birds. The most important natural enemies of the woodcock are considered to be the cat, red squirrel, sharp-shinned hawk, and mink. The best preventive measure suggested for protecting the woodcock is to abolish all spring and summer shooting. Similar measures may be profitably adopted for protecting the wood duck.

Notes on the winter habits of the red-headed woodpecker, H. A. WINKENWERDER (*Bul. Wisconsin Nat. Hist. Soc., n. ser., 2 (1902), No. 1, pp. 69–74*).—Numerous observations were made on the feeding habits of the red-headed woodpecker, and especially upon the habit of this bird in storing food for winter use. Attention is especially called to their habit of storing grasshoppers and other insects in cracks of wood and other locations, from which they may be removed and eaten by the birds during the winter. In order to obtain data concerning the distribution and habits of the red-headed woodpecker within the State, 150 circulars of inquiry were sent to different parts of the State, and 100 of these were filled out and returned. The answers thus received are presented in tabular form.

Regulations for the importation of eggs of game birds for propagation, J. WILSON (*U. S. Dept. Agr., Division of Biological Survey Circ. 37, pp. 2*).—In accordance with the act of Congress approved June 3, 1902, permits will be required for all eggs of game birds introduced into the United States. For the present permits will be issued for the importation of eggs of the following families of birds: Gallinæ, Otididæ, Rallidæ, Anatidæ, and Tinamidæ. All packages containing eggs must be properly marked and will be subject to inspection at the custom-house.

Interstate commerce in birds and game, J. WILSON (*U. S. Dept. Agr., Division of Biological Survey Circ. 38, pp. 3*).—A brief statement is made of the important provisions in various laws relating to the shipment of game, marking packages, special restrictions regarding game in general and western and Alaskan game, and provisions concerning propagation and private use of game, insectivorous birds, and birds for millinery purposes.

Importation of reptiles into Hawaii, J. WILSON (*U. S. Dept. Agr., Division of Biological Survey, Circ. 36, folio*).—The present circular amends Circular 30, so that from July 1, 1902, until further notice permits are required for the entry of reptiles in all ports of the Hawaiian Islands. No permits are to be issued for the introduction of poisonous snakes.

Zoological yearbook for 1901, P. MAYER (*Zool. Jahresber., 1901, pp. VIII+499*).—This volume, as usual, contains detailed bibliographical lists, together with brief abstracts of the literature on Protozoa, Porifera, Cœlenterata, Echinodermata, Vermes, Bryozoa, Brachiopoda, Arthropoda, Mollusca, Tunicata, and Vertebrata, as well as on general biology and embryology.

METEOROLOGY—CLIMATOLOGY.

The Chinook winds, A. T. BURROWS (*U. S. Dept. Agr. Yearbook 1901, pp. 555–566, figs. 3*).—This paper discusses the origin of the application of the name Chinook to winds and explains that there are 3 kinds of Chinook winds, all of which possess high temperatures. "One is moist and may be followed by rain. It occurs only near the ocean. Another is a dry wind, and rain seldom follows for some time after its occurrence. The third wind occupies an intermediate stage, and, from the present knowledge of it, seems a combination of the other two. From November to March these Chinooks play an important part in determining the character of the weather in the Northwestern States. They are active agents in tempering the severity of the winter. When they arrive cold waves vanish, the snow disappears, and a short period of bright, balmy, spring-like weather ensues. The Chinook aids the railroads in keeping their tracks free of snow, enables the stockmen to bring their cattle safely through the winter, and stores up water in the form of ice for future use, making irrigation in the summer possible. It is an ever-welcome guest, whose coming is indicative of good and whose absence would be a momentous evil."

Sun spots and wind, A. B. MACDOWALL (*Nature [London], 66 (1902), No. 1709, p. 320, fig. 1*).—Curves based on observations during 60 years on wind direction and sun spots at Greenwich are given, which show "less northerly wind about maxima than about the adjoining minima [sun spots]."

Meteorological observations, C. B. Ridgaway (*Wyoming Sta. Rpt. 1902, pp. 62, 63*).—A summary of observations at Laramie, Wyo., on temperature, relative humidity, dew-point, atmospheric pressure, precipitation, evaporation, and direction and velocity of the wind during the year 1901.

Comparison of temperature and rainfall of 1900 with records of previous years, E. R. Demain (*Pennsylvania Dept. Agr. Rpt. 1901, pt. 1, pp. 680–683*).—A monthly summary is given of observations at Harrisburg, Pa., during each month of 1900 on pressure, temperature, precipitation, humidity, dew-point, cloudiness, vapor pressure, and wind movement. The average temperature and rainfall for 1900 and for 11 previous years are also given. The mean temperature for the 12 years was 52.2°; for 1900, 54.3° F. The average rainfall for the 12 years was 38.44 in.; for 1900, 28.94 in.

The decrease of temperature with altitude, M. Moreno y Anda (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 17 (1902), No. 1–2, pp. 53–61*).

A study on the diurnal variations in the meteorological elements of the atmosphere, L. Teisserenc de Bort (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 4, pp. 253–256, fig. 1*).—The author reports the results of observations by means of captive kites and balloons on the daily temperature variations in the atmosphere over Paris at a height of 11 kilometers during the period from January 27 to March 1, 1901.

Hail shooting in lower Austria, 1900–1901, J. von Jablanczy (*Das Hagelwetterschiessen in Niederösterreich, 1900–1901. Vienna: Niederöster. Landes-Ausschusses, 1902, pp. 55, pls. 5, figs. 4, charts 4*).—The conclusions reached are in effect that the results of hail shooting have not been conclusive, although apparently effective in many cases when carefully done. Further studies are considered necessary to determine the practicability of the method and directions are given for the systematic application of the method.

Firing to prevent hail, E. Vidal (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 2, pp. 92, 93*).—A summary of observations tending to prove the effectiveness of the method.

Fog studies, A. G. McAdie (*Amer. Inventor, 9 (1902), No. 14, pp. 209–211, 214, figs. 6*).—A brief account of studies made in the vicinity of San Francisco, mainly on Mount Tamalpais.

Short period solar and meteorological variations, N. and W. Lockyer (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 8, pp. 361–364, figs. 2*).

The atmosphere, J. W. Lee (*Queensland Agr. Jour., 11 (1902), No. 1, pp. 50–52*).—A brief popular discussion of properties of the air, especially as related to the soil and the best means of securing proper aeration of the soil through cultivation.

A new organic gas of the atmosphere, H. Henriet (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 2, pp. 101–103*).—The occurrence in small amounts in the air of a formiamid with one replaceable hydrogen $\left(\mathrm{HCON}\begin{matrix}\diagup \mathrm{H}\\ \diagdown \mathrm{R}\end{matrix}\right)$ is reported.

Verification of the law of barometric heights, W. de Fonvielle (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 8, pp. 335, 336*).

Observations on the climatology of Mexico, T. L. Laguerenne (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 17 (1902), No. 1–2, pp. 43–51*).

WATER—SOILS.

Experiments in evaporation, C. B. Ridgaway (*Wyoming Sta. Bul. 52, pp. 43–55, fig. 1*).—This is an account of observations on the rate of evaporation and rise of alkali in cylinders of soil 25 in. long and 6 in. in diameter, in which the water was kept at a certain level by subirrigation, and on evaporation from a water surface.

The effect of stirring the soil to certain depths was also studied and the influence of the alkali on the evaporation was noted. The apparatus used and the method of filling the cylinders with undisturbed soil are described. After filling, the cylinders were buried to their tops in the soil. Observations during 1901 are recorded. From these the following conclusions are drawn:

"The evaporation from the surface of the soil with the level of water maintained at 6 in. below was 95 per cent, at 12 in. below it was 70 per cent, at 18 in. below it was 45 per cent, and at 22 in. below it was 35 per cent of what it was at the surface of the water in the evaporation tank.

"Stirring the ground once a week to the depth of 2 in. retarded evaporation to the amount of 19 per cent, when stirred to a depth of 4 in. it was retarded 23 per cent, and when stirred to a depth of 6 in. evaporation was retarded 45 per cent. The water in all 3 of the pipes was maintained at a depth of 22 in. below the surface of the soil.

"Evaporation was retarded 43 per cent when the soil contained 0.0597 per cent of alkali and the level of water was maintained at 6 in. below the surface. The amount of retardation was 55 per cent in soil containing 0.5116 per cent of alkali and the level of water 12 in. below the surface. In soil containing 0.5375 per cent of alkali the amount of retardation was 50 per cent when the level of water was maintained at 18 in. below the surface; while the retardation was 57 per cent in soil containing 0.6205 per cent of alkali and the level of water kept at 22 in. below the surface. The amount of alkali is the average amount found in the entire 26 in. of soil.

"More alkali was found in the first 3 in. than in any other 3 in. of the soil.

"More alkali was found in the last 2 in. than in the 3 next above."

The progress in the field of chemistry of waters, including natural and artificial mineral waters, A. GOLDBERG (*Chem. Ztg., 26* (*1902*), *No. 78, pp. 912–918*).—A review of investigations on this subject, containing numerous references to articles, during the years 1899–1901.

The bacteriological analysis of drinking waters, BORDAS (*Ann. Chim. Analyt., 7* (*1902*), *pp. 249, 250; abs. in Chem. Centbl., 1902, II, No. 7, p. 537*).

Seventh annual report for the year 1901 of the Agricultural Experiment Station of Ploti (*Sept. Rap. An. Sta. Expt. Agron. Ploty, 1901, pp. XIV+180*).—This report contains accounts in the Russian language, with résumés in French, of observations and investigations in the meteorological station, chemical laboratory, and experimental field. This work is in the main a continuation of that of previous years (E. S. R., 14, p. 17.)

Report of the meteorological and agronomic station.—This includes a summary of observations on precipitation, humidity, cloudiness, evaporation, temperature of the air and of the surface of the soil, sunshine, solar radiation, atmospheric pressure, direction and force of wind, and miscellaneous phenomena.

Report on work in the experimental field.—This includes mainly experiments to test the effect of the growing of forage plants on the succeeding crops, rotation experiments, and cultivation of fallows. The results favor the introduction of forage plants of long periods of growth in rotation with winter and spring cereals. The results of tests of Owinsky's method of growing cereals, namely, seeding in strips 30 cm. wide (containing 6 rows) separated by bare strips 38 cm. wide, and cultivating 2 in. deep, indicates that this method possesses no advantages over ordinary methods of culture. From the description given, this method is very similar to that known as the Lois-Weedon system.

Report of the chemical laboratory.—As in previous years, the work of the chemical laboratory consisted mainly of determinations of the amount of ammonia, nitrites, and nitrates brought down in rain water; the nitrogen removed from the soil in some of the more common cereals, such as winter and spring wheat and rye; and a study of the influence of manure in rotation on yield and quality of crop. The results of examination of rain water showed that the total amount of nitrogen brought down in the atmospheric precipitations amounts to only 5.216 kg. per hectare, or not more than 4 to 5 per cent of the amount of assimilable nitrogen necessary for a good crop. The influence of manure was studied in 4-year and 9-year rotations with wheat and oats. It was found that with favorable meteorological conditions the manure increased the total amount of nitrogen taken up by the crops. It increased the total yield but decreased the relative proportion of albuminoid substances in all parts of the plant. In fact it was observed in general that those conditions which favored the increase in yield caused a reduction in the relative proportion of nitrogenous compounds in the plant. Excessive humidity favored the process of assimilation of carbohydrates while drought hastened maturity and favored the production of grain relatively rich in protein and relatively poor in carbohydrates.

On the question of the productiveness of different soil layers, S. STSCHUSSEV (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *2* (*1901*), *No. 5, pp. 611-624, figs. 2*).—Pot experiments with oats on chernozem soil from 3 depths—surface, 17.8 cm., and 26.7 cm.—are reported. The surface soil was much more productive than that of the other 2 layers. In the surface soil the nitrogen was the first constituent to become exhausted, in the other layers phosphoric acid.

Comments on the paper by S. Stschussev on the productiveness of different soil layers, D. RUDSINSKY (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *3* (*1902*), *No. 1, pp. 38-43*).

On the water-soluble phosphates of the soil, T. SCHLOESING, JR. (*Compt. Rend. Acad. Sci. Paris, 134* (*1902*), *No. 23, pp. 1383, 1384*).—Summarizing the results of numerous experiments the author concludes that the phosphates of the soil are constantly being rendered soluble in water and available for the use of plants. This process is slow in any case, but is more rapid in moist soils than in dry. The continued application of phosphatic fertilizers accelerates this process; that is, soils so fertilized yield a larger amount of phosphoric acid soluble in water than can be accounted for by the fertilizers applied. The amount soluble in water is always small, and can be obtained only by treating a small amount of soil with a large amount of water (100 liters of water to 100 gm. of soil), extracting by means of displacement rather than by shaking in flasks.

A contribution of the study of the influence of frost on the physical properties of soils, A. MITSCHERLICH (*Fühling's Landw. Ztg., 51* (*1902*), *Nos. 14, pp. 497-503; 15, pp. 532-537*).—The author concludes from his observations on the influence of repeated freezing (as high as 23 times) of different classes of soil as measured by his *Benetzungswärme* method (E. S. R., 10, p. 423; 14, p. 127) that frost is without measureable effect in increasing the aggregate surface area of the individual soil particles.

On the question of the mechanical analysis of soils, P. KASCHINSKY (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *2* (*1901*), *No. 3, pp. 315-336*).—The results of a study of the Osborne method are reported (in Russian with a summary in German).

Vegetation boxes for studying the water content of soils, C. VON SEELHORST (*Jour. Landw., 50* (*1902*), *No. 3, pp. 277-280*).—The construction of a lysimeter for the study of drainage, evaporation, water requirements of plants, etc., is described.

Analysis of the soil by the plant, T. LOKOT (*Selsk. Khoz. i Lyesor., 205* (*1902*), *Apr., pp. 91-135*).—The author gives an extended survey of the literature on this subject and discusses its present status, explaining the principles underlying the methods employed in studying the fertilizer requirements of plants on different soils—chemical analysis of soil and plant, and vegetation experiments. Both these methods are considered unreliable in practice, although susceptible of much improvement by the exercise of greater care in sampling the products for examination. In the author's opinion it still remains for agricultural chemistry to devise an accurate method for determining the fertilizer requirements of plants, and this method will be purely chemical in character.—P. FIREMAN.

The nitrifying ability of normal soils and the loss of nitrates by leaching, A. V. KLYUCHAREV (*Izv. Moscow Selsk. Khoz. Inst.* (*Ann. Inst. Agron. Moscou*), *8* (*1902*), *No. 2, pp. 107–149*).—In continuation of previous work on the same subject (E. S. R., 13, p. 535), the author undertook to investigate more fully and in greater detail the phenomena which take place when soils are in contact with solutions of nitrates. He found in experiments in cylinders containing from 2½ to 3½ kg. of soil that in case of soils containing a large amount of imperfectly decomposed organic matter, or those to which starch was added, there was a marked denitrification, while in soil in which humification was very advanced, like the chernozems, and to which no starch was added, there was little or no destruction of nitrates during 15 days. These results indicate that the rate of denitrification is dependent largely upon the amount of starch and similar compounds in the soil. It was shown in other experiments that plant roots which are rich in pentosans also accelerate denitrification to a marked degree. Chloroforming the soil prevented denitrification. The results further indicate that a considerable proportion of the nitrogen set free in the process of denitrification goes in organic combinations—P. FIREMAN.

The crop and the soil in their mutual relations, S. BOGDANOV (*Selsk. Khoz. i Lyesor.*, *205* (*1902*), *Apr., pp. 51–90*).—A review of a book by Bogoushevski entitled Bad Crops and the Exhaustion of Lands—an Investigation of the Question of the Causes of the Exhaustion of the Fertility of Soils, which minimizes the value of chemical theory of the exhaustion of soils and gives prominence to the physical causes of temporary unproductiveness due to improper management of the soil. The reviewer maintains that the chemical and physical factors are of equal importance, and that the use of fertilizers is an effective and necessary means of restoring and maintaining the fertility of exhausted soils.—P. FIREMAN.

Practical experiments in the restoration of worn-out soils, R. F. SCHWARZ (*Pennsylvania Dept. Agr. Rpt. 1901, pt. 1, pp. 489–494*).—A brief account is here given of practical experience in restoring worn soils by means of leguminous plants—crimson clover, cowpeas, vetches, etc.

The purpose of a soil survey, M. WHITNEY (*U. S. Dept. Agr. Yearbook 1901, pp. 117–132*).—This article discusses the knowledge of conditions necessary for agricultural success, explains the deficiencies of older methods of soil investigation, and describes the methods, purposes, and some of the results of the soil survey developed in this Department.

FERTILIZERS.

The action of the solid constituents of stall manure, M. GERLACH (*Jahresber. Landw. Vers. Stat., Jersitz-bei-Posen, 1900–1901, p. 26; abs. in Centbl. Agr. Chem., 31* (*1902*), *No. 10, pp. 663–665*).—Pot experiments comparing the fertilizing effect of liquid manure and of manure which had been stirred up with 3 times its volume of water and afterwards pressed are reported. It was found that the nitrogen of the manure was in every case much less effective than that of nitrates, that the solid constituents of the manure exerted an injurious effect, and that the action of nitrate nitrogen was reduced when applied in connection with the pressed manure.

A new method of conserving manure and urine, P. RIPPERT (*Fühling's Landw. Ztg., 51* (*1902*), *Nos. 7, pp. 248–254, fig. 1; 8, pp. 278–285; 9, pp. 334–340*).—Laboratory experiments to test the value of different methods of mechanical treatment and different kinds of preservative substances are reported. The results indicate the importance of keeping manure compact, as in deep stalls, and show the effectiveness of fluor-sulphuric acid, a by-product of superphosphate manufacture containing 10 to 12 per cent of free sulphuric acid and 20 per cent of fluorin, as a preservative as compared with other preservatives frequently recommended—superphosphate-gypsum, sulphuric acid, etc.

Manures and manuring, O. Lemmermann (*Die Düngerlehre. Leipsig: Moritz Schäfer, 1902, pp. 240, figs. 8*).—This book is based largely upon the author's own investigations and is intended for the general reader as well as for the use of students and teachers of agriculture. It contains chapters on the conditions of growth of plants, the general subject of manuring , and on the source, nature, and use of different kinds of fertilizing materials, including barnyard manure, green manures, and commercial fertilizing materials.

Commercial fertilizers, W. W. Miller and N. W. Lord (*Offic. Rpt. Sec. Ohio State Bd. Agr. on Com. Ferts. 1901, pp. 92*).—This is a report of analyses of 537 samples of fertilizers examined by the State chemist during the year 1901, with a list of certificates filed by manufacturers, etc., under the State law. The analyses are accompanied by explanatory notes and the text of the State fertilizer law.

Analysis of commercial fertilizers sold in Maryland, H. B. McDonnell et al. (*Maryland Agr. College Quart., 1902, No. 17, pp. 65*).—A report in the usual form of analyses and valuations of 494 samples of fertilizers examined from February to June, 1902, inclusive.

Fertilizer analyses, R. C. Kedzie (*Michigan Sta. Bul. 202, pp. 219–243*).—Analyses of 91 samples of fertilizers, with explanatory notes.

On the relative availability for agricultural plants of the phosphoric acid of mineral phosphates, P. Kossovich (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*] *2* (*1901*), *No. 6, pp. 711–732, pl. 1*).—Pot experiments are reported which show that mustard and buckwheat gave about the same yield with mineral phosphate as with Thomas slag; clover and flax showed less capacity for utilizing the mineral phosphate; and winter rye utilized the phosphoric acid of such phosphates to only a limited extent.

Basic superphosphate, its composition and use as a manure, J. Hughes (*Jour. Bath and West and South. Counties Soc.* [*England*], *4. ser., 12* (*1901–2*), *pp. 65–78, fig. 1*).—See E. S. R., 13, p. 234.

Relation between the amounts of phosphoric acid and ammonia in plants, especially in sugar beets, H. Pellet (*Ztschr. Ver. Deut. Zuckerind., 1902, No. 555, pp. 390–393; abs. in Jour. Chem. Soc.* [*London*], *82* (*1902*), *No. 478, II, p. 526*).—Results of examinations of Egyptian beets grown on soil formed by the gradual accumulation of Nile mud and containing only traces of ammonia or nitric acid are reported, which confirm the conclusion of Champion and Pellet that plants contain ammoniacal nitrogen and phosphoric acid in the proportions to form ammonium magnesium phosphate.

Ammonia salts as a source of nitrogen for plants, P. Kossovich (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *2* (*1901*), *No. 5, pp. 625–638, figs. 3*).—Experiments made under conditions which precluded the presence of any form of nitrogen except ammonia salts showed that peas utilize such nitrogen in their growth about as well as that of nitrates. Other investigations on this subject are reviewed and the apparatus and method used by the author are described in detail. The article is in Russian, but contains a summary in German.

The solvent action of ammonia salts on phosphorites, I. Shulov (*Izv. Moscow Selsk. Khoz. Inst.* (*Ann. Inst. Agron. Moscou*), *8* (*1902*), *No. 2, pp. 161–167*).—Vegetation experiments which were carried out in the Moscow Agricultural Institute in 1900 under the direction of Professor Prianishnikov showed that ammonium sulphate and nitrate further the assimilation by the plants of phosphoric acid from phosphorites. The cause of this favorable assimilation is presumably the so-called physiologically-acid nature of the ammonium salts. Vegetation experiments carried out by the author with barley corroborated these observations. When calcium nitrate was used as nitrogen fertilizer with phosphorite the yield was only 7.2 gm., containing 11.38 mg. phosphoric acid; but the crop increased to 44.8 gm. with 151.15

mg. phosphoric acid when ammonium nitrate was used instead of calcium nitrate, the same phosphorite being applied.

Experiments made with a view to determining whether this action of the ammonium salts is not at least in part due to their solvent action on the phosphorites showed that this solvent action is very slight. Digestion for a month of 10 gm. phosphorite with 1,000 cc. of 1 per cent ammonium sulphate solution with frequent shaking caused the solution of only 4.98 mg. phosphoric acid. Ammonium nitrate exerted a still lower solvent action. It follows that the influence of the ammonium salts on the increase of the yield must be due to physiological causes.—P. Fireman.

The action of nitrogen in absence of other nutritive substances, H. Wilfarth (*Bl. Zuckerrübenbau, 1901, p. 15; abs. in Jour. Chem. Soc.* [*London*], *82* (*1902*), *No. 478, II, p. 526*).—It was found that sugar beets grown with potash and with little nitrogen contained 11.03 per cent of sugar. With large amounts of nitrogen but no potash the beets contained only 0.0062 per cent of sugar. Potatoes similarly fertilized contained 14.6 and 9.76 per cent of starch respectively.

Effect of nitrogen in nitrates and of humus substances on the inoculation of leguminous plants, F. Nobbe and L. Richter (*Landw. Vers. Stat., 56* (*1902*), *No. 5–6, pp. 441–448; abs. in Jour. Chem. Soc.* [*London*], *82* (*1902*), *No. 478, II, p. 521*).—Pot experiments are reported in which oats and soy beans were grown separately or in mixtures on humus soil or a mixture of the soil with sand, one series of pots being inoculated, the other being sterile. In case of the mixed soil there was an additional series of pots to which potassium nitrate was added. The effectiveness of inoculation was diminished both by the nitrogenous matter of the soil and by the nitrate added. The activity of the nodule bacteria was increased by growing oats with the beans, due, it is believed, to the fact that the oats removed nitrates from the soil. The yield of oats was greater when grown with beans than when grown alone.

Perchlorate of potash in plant growth; the harmlessness of nitrates of soda imported from Chile, L. Grandeau (*Jour. Agr. Prat., n. ser., 4* (*1902*), *No. 35, pp. 271–273*).—A brief review of investigations on the subject, from which it is concluded that while nitrate containing 1 per cent of perchlorate is injurious to crops, especially to rye, there is, under present conditions, little danger of such nitrate being shipped from Chile. However, for greater security, purchasers are advised to require a guaranty of less than 1 per cent of perchlorate.

FIELD CROPS.

Influence of environment on the chemical composition of plants, H. W. Wiley (*U. S. Dept. Agr. Yearbook 1901, pp. 299–318, charts 3*).—This article deals chiefly with the studies conducted by the Bureau of Chemistry on the composition of plants as affected by environment. A review is given of the early studies in this direction. Recent work has consisted of observations on the influence of environment on the chemical composition of cereals, sugar-producing plants, cantaloupes, and muskmelons.

In the earlier work with wheat, seed of many different varieties was sent to Colorado, Oregon, California, and North Carolina for growth, and the results showed that the Colorado-grown wheat was richer in protein than the original seed, while that grown in the other States was decidedly poorer in protein than the original seed. The general conclusion is drawn that the environment of Colorado increased the nitrogen content of wheat, and it is shown that this increase was made at the expense of the carbohydrate content. The results obtained in Oregon, California, and North Carolina showed an increase of carbohydrate content at the expense of the nitrogen. It is pointed out that "the soil, as a rule, has the least effect of all the important factors of environment on the chemical composition, provided, of course, that it contains the essential elements of plant food necessary to produce an average crop."

A study similar to the one with wheat was made with corn. The conclusions drawn from the results were that corn differs materially from wheat, since "it maintains about the same percentage of albuminoids under all circumstances and is not affected by its surroundings in this respect." Corn is considered as a crop tending more than any other to maintain a uniform composition and to vary less under environment.

A special investigation in this same line in collaboration with the Colorado, California, Indiana, Kentucky, Maryland, Missouri, and New York experiment stations is reported. The tabulated results of analyses of the original seed of the first crop of wheat grown show that the protein content of wheat is extremely sensitive to environment of a meteorological nature; that the starch content is also sensitive, but in an inverse ratio, and that the ash next to the protein shows a tendency to vary with environment. The soil and the fertilizer applications are considered the most potent factors in the variation of the ash content.

In a discussion of the effect of season and climate upon the wheat grain, the influence of the period of growth and the temperature are pointed out. "The shorter the period of growth and the cooler the climate, the larger the content of protein and the smaller the content of starch, and vice versa. . . . The general deduction which can be made . . . is to hasten the period of growth as much as possible where a high content of protein is desired." The results of foreign experiments given in this connection indicate that the elaboration of starch is arrested by the rapid desiccation of the plant.

The work with sugar beets treated in this article has been noted from previous publications of the Bureau of Chemistry and the experiment stations.

The influence of fertilization on the number and depth of the roots of different plants, C. von Seelhorst (*Jour. Landw., 50* (*1902*), *No. 1, pp. 91–104*).—Rye, spring and winter wheat, barley, peas, beans, potatoes, and field beets were given varying quantities of a complete fertilizer application and the number of fibrous roots for each 25 cm. to a depth of 150 cm. ascertained. The figures are given in a table, and the results with the different plants are compared. The author cautions against the general application of the results, because the soil upon which these tests were made is absolutely uniform in substance and quality to more than an ordinary depth. The results indicate in general that a good supply of plant food tends to produce a strong, well-developed root system, with roots growing to greater depths than when the supply of plant food is limited. For this reason the author believes that heavily fertilized crops are better able to withstand drought than those having received but light applications.

Observations on the relation of different crops to the water content of the soil, C. von Seelhorst (*Jour. Landw., 50* (*1902*), *No. 2, pp. 151–164*).—Rye, wheat, potatoes, clover, peas, oats and peas, and turnips were grown on plats and the moisture content of each plat determined on a series of dates. The data for the entire experiment are presented in tabular form.

The variation in the moisture content of the soil as here observed is attributed to the different moisture requirements of the several crops at various stages of their development, to the varying capacity of water absorption by the soil, and the fluctuating rate of evaporation due to the condition of the atmosphere and the density of the foliage of the plants grown. The author discusses the results observed in each case. It was found that rye drew less moisture from the soil than wheat, and this fact is considered of value in growing crops for green manuring immediately after the rye has been harvested. The moisture content of the clover plat was comparatively quite low, indicating that a crop following clover is at a disadvantage so far as soil moisture is concerned. The potato crop left the soil in a relatively moist condition. Peas, owing to the small quantity of water drawn from the soil, are considered a suitable crop to be followed by winter cereals. Oats, on the other hand, were found not at all suitable for this purpose on account of the large quantity of plant food removed from the soil, and especially on account of the heavy withdrawal of soil moisture.

Progress in plant and animal breeding, W. M. HAYS (*U. S. Dept. Agr. Yearbook 1901, pp. 217-232, pls. 3, fig. 1*).—After enumerating some of the most important and striking achievements in plant and animal breeding and suggesting what the purposes of breeding should be, the article describes the features of sugar beet, wheat, and corn breeding, and some of the methods of breeding used by farmers. Methods of cooperation in this kind of work are outlined.

The length of the growing season in North Dakota, E. F. LADD, J. H. SHEPPERD, and A. M. TEN EYCK (*North Dakota Sta. Bul. 52, pp. 105-111*).—Tables show the dates of the first killing fall and last killing spring frosts and the last spring and first fall frosts for 7 years, together with the length of time required to mature field crops as observed in a variety of experiments conducted at the station. A temperature of 26° F. is considered as a killing frost. The shortest time between killing spring and fall frosts during 7 years was 121 days, the longest 155 days, and the average length of time 136 days. The average length of time between light frosts was 111 days, with a range from 97 to 131 days. As to the number of days required for different crops to mature, the records show that wheat required from 95 to 106 days, oats 88 to 102 days, barley 82 to 94, flax 83 to 95, millet 81 to 112, spelt 91 to 92, and corn about 100 days. A discussion of how late small grain may be sown is based on these data.

The annual report of the Burdwan Experimental Farm for the year 1900-1901, D. N. MOOKERJI (*Calcutta: Dept. Land Records and Agr., Bengal, 1902, pp. 14*).—A description is given of the experimental farm, together with a financial statement and a report on experiments for the year 1900-1901. In fertilizer experiments with rice the use of bone meal and nitrate of soda was most profitable, and green manuring with jute proved more economical than the application of cow manure. In a series of experiments with jute, cow manure was more effective than castor pomace, bone meal, or a combination of superphosphate and nitrate of soda. Among different fertilizers for potatoes, castor pomace gave the best returns.

Sowing 60 lbs. of rice per acre was found more profitable than sowing 30 lbs. In growing potatoes the sets gave a larger yield than whole tubers. Of 4 varieties of sugar cane under test the Kajli was the only one grown with profit. The largest yield of different varieties of potatoes was obtained from Naini Tal grown from imported seed. Black-seeded sorghum yielded 2,180 lbs. of fodder per acre and red-seeded 18,939 lbs.

Experiments with field crops (*County Councils Cumberland, Durham, and Northumberland, Tech. Education. Rpt. 10 (1901), pp. 1-121, 125-150*).—The results of cooperative fertilizer and variety tests with swedes, turnips, potatoes, mangels, cereals, and grass are reported. In addition to the results of these experiments, the composition of the crops as influenced by the fertilizers applied is shown. Analyses of soils are also given.

Pot experiments were made to investigate the absorption of arsenic by barley and the effect of an electric current passing through the soil on the growth of the plants. Arsenic was applied to the pots at the rate of 11 lbs. per acre, but the soil itself was found to contain a greater amount. Most of the arsenic occurrred in the grain of the barley obtained. Soil electrolysis was found to be detrimental to plant growth in the experiments reported.

Report on the work at the Provincial Experimental Garden at Ghent in 1900-1901, P. DE CALUWE (*Exposé Cult. Exper. Jard. Gand, 1900-1901, pp. 1-47, dgm. 1*).—The work comprises fertilizer, variety, and culture tests with rye, oats, corn, peas, colza, chicory, fodder beets, prickley comfrey, sacchaline, turnips, potatoes, and grasses. The results for the season are briefly reported and discussed.

The management and improvement of the range, E. NELSON (*Wyoming Sta. Rpt. 1902, pp. 34-37*).—Methods of range management and improvement are briefly mentioned. Among the means described are resting, rotative pasturing, reseeding, harrowing, and discing.

Experiments with cereals on the development of roots and adventitious shoots from the nodes above ground, C. VON SEELHORST (*Jour. Landw., 50 (1902), No. 2, pp. 165, 166, pls. 4*).—By covering the nodes of growing plants of wheat, oats, barley, and rye with soil, both roots and shoots were produced from the nodes. Wheat produced the best growth.

The influence of fertilizers on the form of cereal plants, H. CLAUSEN (*Jour. Landw., 49 (1902), No. 4, pp. 365-388*).—From the results of experiments here reported it is concluded that applications of nitrogen lengthened the lower internodes, while the upper internode was relatively shortened. Nitrate of soda was more effective in bringing about this result than nitrogen in the form of ammonia. An increase in the length of the lower internodes increases the tendency to lodge, especially when the strength of the upper and lower internodes is out of proportion. The ammoniacal nitrogen not only produced the highest total yield, but also the strongest plants, as compared with nitrate of soda.

Changes of nitrogenous substances in cereals during ripening, N. NEDOKUTSCHAJEW (*Landw. Vers. Stat., 56 (1902), No. 4, pp. 303-310*).—This article notes briefly the work and views of different investigators on this subject, and reports the author's own results. The grains of wheat, rye, oats, and barley were analyzed at 6 different stages during about 1 month preceding their maturity. The results are shown in tables. The data obtained indicated that the ripening of the grain is a gradual change of the soluble substances into solid and stationary form. The author states that the amid combinations in the grains under the influence of unknown causes seem to change to albumin. The increase in albumin in the grain takes place at the expense of the amid nitrogen. The proportion of the total nitrogen in the form of asparagin is shown in connection with the other data.

Alfalfa, F. E. EMERY (*Wyoming Sta. Rpt. 1902, pp. 22-26*).—The value of alfalfa for Wyoming is discussed and compilations from various sources are given showing the digestible nutrients in alfalfa hay and other feeding stuffs, together with the comparative money values.

Breeding and cultivation as a means of improving and increasing the culture of barley for brewing purposes, REMY (*Deut. Landw. Presse, 29 (1902), Nos. 19, p. 155; 20, pp. 163, 164; 21, p. 176*).—The results of observations on the plant food and moisture requirements of different varieties of barley are presented and discussed. Hanna barley produced a large total crop and a good yield of grain with a comparatively small moisture supply, and in addition did not prove very sensitive to a supply of soil moisture above the normal. It was found that this variety as compared with the Goldthorpe reaches its maximum water consumption 2 weeks earlier, enabling it to use more of the moisture stored in the soil during winter. The results of experiments indicated that by selecting plants having a small number of internodes, long upper internodes, and producing a high percentage of grain the productiveness of the variety can be increased. The possibility of obtaining varieties in which the moisture requirement is reduced and the period of maximum moisture consumption comes earlier in the season is discussed. Seed selection, improved cultural methods, and the rational use of fertilizers are recommended as means for improving the crop.

The culture of forage beets in different sections of France, P. P. DEHÉRAIN (*Ann. Agron., 28 (1902), No. 7, pp. 351-356*).—This article discusses cooperative distance experiments with forage beets conducted at different times. Attention is called to the composition of beets grown at varying distances, and reference is made to previous recommendations of the author that good beets with a low content of nitrate of potash and rich in dry matter can be grown by leaving the plants when thinning at intervals of 25 cm. in rows 40 cm. apart. This method it is stated produces beets of about 1 kg. in weight, and although giving a smaller total production, yields a larger amount of dry matter and sugar and reduces the percentage of nitrate of potash in the beets.

Forage-beet culture at Grignon in 1900 and 1901, P. P. Dehérain and C. Dupont (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 17, pp. 953–958*).—From the results for the 2 seasons the authors conclude that the new varieties tested, namely, Giant White and Giant Rose, having a high sugar content, are decidedly superior to the ordinary older varieties of field beets, and that the Giant Rose is adapted to dry soils and the Giant White to moist soils. Growing beets in rows 50 cm. apart, with the plants at intervals of 20 cm. in the row, is considered most advantageous. With this spacing 10 beets are grown per square meter.

Culture tests with red clover, O. Burchard (*Landw. Wchnbl. Schleswig-Holstein, 52 (1902), No. 33, pp. 611–613*).—Tests with red clover seed obtained from different European countries and Canada and from Wisconsin, Indiana, Ohio, and Maryland are reported. The clover from American seed stood the winter most satisfactorily and gave the highest yields.

Experiments with gypsum on clover and vetch, J. Withycombe (*Oregon Sta. Rpt. 1902, pp. 50, 51*).—The yields of green clover from plats having received different quantities of gypsum are reported without comment. An acre of fall-sown vetch received 100 lbs. of land plaster April 17 and yielded 9,031 lbs. of hay July 11, as compared with a yield of 7,394 lbs. of hay on an adjoining acre, which was used as the check plat. The result showed a gain of 22 per cent in favor of the gypsum.

Fertilizer, culture, and variety tests with corn and cotton, B. W. Kilgore, R. W. Pou, and J. L. McKinnon (*Bul. North Carolina State Bd. Agr., 23 (1902), No. 1, pp. 1–43, pls. 9*).—A report of work on the department's test farms in 1901. The work is described and the weather conditions for the season are reported. The results of the different experiments are tabulated in detail.

The largest yield of corn was obtained from Weekly Improved at both test farms, the yield being 29.5 bu. per acre at Tarboro Farm and 18.95 bu. at Red Springs Farm. Russell Big Boll was the most productive of the varieties of cotton tested on both farms. No conclusions are drawn from the distance tests with either corn or cotton, but the data are reserved for further use.

The results in the fertilizer tests are tabulated in detail and the comments on the results have reference to the requirements of the respective soils. With corn, as well as with cotton, the fertilizer applications were more profitable in the wet season of 1901 than in the dry season of 1900. In the case of corn increasing the nitrogen, phosphoric acid and potash in the normal application gave considerable profit, the increase in yield being about equally in favor of nitrogen and phosphoric acid and the increase in value of product about equally in favor of phosphoric acid and potash. With cotton increases in the quantity of nitrogen gave larger yields and larger net profits than a similar increase in either phosphoric acid or potash. The largest yield and largest net profits were obtained on a plat which had received 423.6 lbs. of cotton-seed meal per acre, or treble the quantity of nitrogen given in the normal application.

The nonproductive black soils occurring in the State and locally known as "pocosin" soils are described and methods of treatment suggested.

Detasseling corn, A. D. Shamel (*Illinois Sta. Circ. 56, pp. 4*).—This circular outlines a method of investigating the effect of detasseling corn.

Number of barren stalks in Illinois cornfields, A. D. Shamel (*Illinois Sta. Circ. 57, pp. 4*).—A circular giving directions for determining the percentage of barren stalks in a cornfield.

Flax experiments, 1901 (*Jour. Dept. Agr. and Tech. Instr. Ireland, 2 (1902), No. 4, pp. 636–653*).—The results of fertilizer, variety, and scutching tests are tabulated and discussed. The use of 5 cwt. of superphosphate per acre increased the yield of retted straw but reduced the yield of scutched flax, together with the quality. On foul land this application encouraged the growth of weeds. The use of superphosphate in conjunction with 3 cwt. of kainit per acre was also found unprofitable. An application of the same quantities of superphosphate and kainit, together with ½ cwt. of sulphate of ammonia per acre also failed to give profitable results. A plat which had received 5 cwt. of kainit per acre gave a small profit as compared with the check plats, showing that kainit has no detrimental effect on the flax crop. Muriate of potash applied at the rate of 1 cwt. per acre gave better results than any other fertilizer application tested, indicating that potash fertilizers benefit the flax crop, and that muriate of potash is more effective in this respect than kainit. Flax seed grown in Ireland gave less profitable results than seed obtained from the continent. Pernau Crown flax was more productive and more remunerative than Riga Child. The Irish system of scutching was compared with the Courtrai system, and the results from a financial aspect were in favor of the Irish system.

Experiments with forage crops, T. von Weinzierl (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 2, pp. 49–330, pls. 11, figs. 5, dgms. 24, plan 1*).—This extensive report treats of the results obtained in culture tests with different forage plants conducted in an alpine grass garden from 1890 to 1900. In a brief summary of the results the author points out that certain forage plants ordinarily grown on the plains undergo a morphological, as well as physiological, change when grown in the mountains, which insures their successful culture at higher altitudes. It was further found that alpine species, such as *Poa alpina, Phleum michelii, P. alpinum,* could be successfully grown at an altitude as low as 800 meters in regions where a moist mountain climate prevailed. In general, however, alpine species produced seed best under the conditions prevailing at the altitudes where they normally occur.

The following species are recommended for profitable seed production in an alpine climate: *Poa violacea, P. distichophylla, Festuca rupicaprina, F. violacea, F. rubra fallax, F. scheuchzeri, Phleum alpinum, Trisetum subspicatum, Trifolium alpinum, and Phaca frigida.* For certain sections establishing meadows at altitudes varying from 1,300 to 1,600 meters is considered profitable. Grass mixtures for alpine meadows and for resodding steep slopes are given. A study of the root tubercles of different leguminous forage crops was made and the results tabulated. The length, thickness, form, and location of the tubercles are given.

Guide to the cultivation, harvesting, and marketing of the ginseng plant, with names of buyers; also, a treatise on the history, botany, and uses. (*New York: Crowell & Kirkpatrick Co., 1902, pp. 52.*)

The hemp industry in the United States, L. H. Dewey (*U. S. Dept. Agr. Yearbook 1901, pp. 541–554, pls. 3, fig. 1, map 1*).—After describing the hemp plant and the principal uses of hemp fiber, the article enumerates the different regions, both foreign and domestic, in which hemp is cultivated; discusses the soils suited to the crop, and gives directions for its culture and treatment, including methods of harvesting, retting, and breaking. Statistical data on the price and production of hemp in Kentucky are also given.

Fertilizer experiments with oats, W. Müller (*Fühling's Landw. Ztg., 51 (1902), No. 8, pp. 275–278*).—From the results of experiments here reported it was concluded that the use of 40 per cent of potash salt applied either alone or in conjunction with other fertilizers is not profitable. A heavy application of 40 per cent of potash salt increased the yield of straw without increasing the yield of grain.

Experiments with winter oats, Schacht (*Deut. Landw. Presse, 29 (1902), No. 41, pp. 353, 354*).—The culture of winter oats is discussed, and the results of experiments in determining the germinative energy of small and large grains are reported.

Sowing oats and barley at different rates (*Reading Col., Agr. Dept. Rpt. 1901, pp. 26–29*).—The results with barley showed that 2 bu. of seed per acre in drills 11 in. apart gave the best yield of grain and that the greatest weight per bushel was obtained where from 2 to 2½ bu. of seed were used. With oats the largest yield of best grain was in favor of drilling 11 in. apart. The average results also favored the wide drilling. Of the 2 varieties entering into these experiments, Black Tartarian gave the highest yield, with 4 bu. of seed per acre, while for Garton Abundance from 3½ to 4 bu. was apparently the best quantity.

Improving field peas, M. Fischer (*Fühling's Landw. Ztg., 51 (1902), No. 15, pp. 529–532*).—Experiments were conducted with the Swedish field pea, a variety of *Pisum arvense.* The seed selection was based on the color of the peas and the habits of growth of the plant. The results indicated that a selection of spotted seed varying in color from yellow to reddish brown, from bushy late blooming and late ripening plants, will lengthen the vegetative period and increase the yield of green forage. On the other hand, it is stated that the selection of smaller seeds of a solid green color but well ripened and taken from early blooming and early ripening plants will shorten the vegetative period and thus better adapt the variety to mixed culture with barley.

The effect of different amounts of water used in irrigation upon the yield of potatoes, B. P. Fleming (*Wyoming Sta. Rpt. 1902, pp. 31–34*).—A study was made of the effect of different amounts of water in irrigating potatoes. In 1900 potatoes grown on 3 adjacent plats received from irrigation and rainfall 5, 7, and 10 in. of water, and yielded 1,176, 2,230, and 3,069 lbs. of potatoes per acre respectively. The following season the depths of water used on the respective plats were 17, 8, and 48 in., and the corresponding yields 3,332, 3,956, and 5,432 lbs. of potatoes per acre.

Progress of the beet-sugar industry in the United States in 1901, C. F. Saylor (*U. S. Dept. Agr. Rpt. 72, pp. 1–89, pls. 11, figs. 5*).—This is the annual report on the progress and condition of the beet-sugar industry in the United States in 1901. Similar reports have been published for previous years (E. S. R., 13, p. 445). The report deals with the operations of the various beet-sugar factories, outlines methods for beet culture, and presents considerable statistical information relative to the industry. Lowering the cost of sugar production is discussed and the cost and profits of sugar-beet culture with and without irrigation are estimated. In discussing incidental benefits and by-products the author points out the improvement of land and farming methods incident to the culture of the crop, emphasizes the value of beet pulp for feeding, and suggests how beet leaves should be utilized. The manufacture of sirup and molasses in connection with beet-sugar manufacture is briefly noted. The factories in operation, in process of construction, and projected enterprises in this line are enumerated. The statistics presented relate to factory development; the consumption, production, and importation of sugar, and the factory results for 1901. The consumption and production of sugar in the States and Territories west of the Mississippi and Missouri rivers are graphically shown, and the factory operations for 1901 are reviewed for each State and individual factory. In connection with this statistical information detailed statements are made of the labor required to raise and market beets, together with the cost of the same. The discussion on methods of growing beets consists of notes on preparing the seed bed, planting, bunching and thinning, cultivating, harvesting, and delivering beets.

In 1901, 36 factories were in operation in California, Colorado, Michigan, Minnesota, Nebraska, New Mexico, New York, Ohio, Oregon, Utah, Washington, and Wisconsin. The total acreage of beets for the season was 175,083. The quantity of beets worked amounted to 1,685,688.6 tons and the quantity of sugar produced to 369,211,733 lbs. The average sugar content of the beet was 14.8 per cent, with a purity coefficient of 82.2. The average yield of beets per acre was 9.6 tons. The total consumption of sugar in the United States for 1901 is estimated at 2,372,000 tons.

Progress of the beet-sugar industry in the United States, C. F. Saylor (*U. S. Dept. Agr. Yearbook 1901, pp. 487–502, pls. 4*).—Information on this subject, comprising historical and statistical data reported in the publication noted above, is here given in abstract form.

The influence of weather conditions on the sugar-beet crops for 1891–1900, inclusive, W. Rimpau (*Landw. Jahrb., 31 (1902), No. 2–3, pp. 471–487; abs. in Deut. Landw. Presse, 29 (1902), Nos. 53, pp. 452, 453; 54, p. 460*).—The meteorological conditions for each season are given and discussed with reference to their effect on the growth of the sugar-beet crop. The points taken into consideration as the most important are precipitation, temperature, and duration of sunshine. The author finds that the observations do not warrant definite conclusions. The results showed that the sufficiency and distribution of rainfall has a marked influence on the beet crop, especially on the quantity. The recorded temperatures did not show a regular influence on the yield. The amount of sunshine during the entire growing period, with sufficient moisture in the soil, had a very marked influence on the quantity of the crop, and a large amount of sunshine in August and September was conducive to the production of beets of a high quality. In 1894, however, when the total amount of sunshine was the smallest for the 10 years excepting 1891, the largest yield for the series of years, with a sugar content of 14.24 per cent, was produced.

Instructions for growing sugar beets, C. G. Hopkins (*Illinois Sta. Circ. 52, pp. 5*).—Brief popular recommendations for making culture tests with sugar beets are given, together with an outline for a report on the work and its results.

Sugar-beet seed, production and testing, A. J. Pieters (*U. S. Dept. Agr. Rpt. 72, pp. 101–106*).—This paper discusses the production of sugar-beet seed, and gives a concise description of how the tests for germination are carried out. The importance of using first-class seed is pointed out, and some of the results of experiments with imported and home-grown seed are republished from a bulletin previously noted (E. S. R., 11, p. 337). Tests of the same character made by private parties are also reported, and in both instances the results largely favored the domestic seed.

Variety tests of mangels and sugar beets (*Reading Col., Agr. Dept. Rpt. 1901, pp. 36–42*).—Two varieties of sugar beets and 6 of mangels were tested. Sutton Prizewinner mangel was the most productive, yielding 21.3 tons per acre, while Sutton Improved sugar beet yielded 7.5 tons, being the smallest yield in the test. The analyses of different varieties are given in tables.

Fertilizer and variety tests with sugar cane, J. P. d'Albuquerque and J. R. Bovell (*Rpt. Agr. Work, Imp. Dept. Agr. West Indies, 1899–1901, pp. 2–178*).—This report gives in tabular form the results obtained on different plantations from 1899 to 1901. The rainfall for each month and its composition, and the chemical composition of soils on which the experiments were carried on, are also reported. The fertilizer experiments consisted of soil tests on the different plantations, and the applications used in this work were arranged to demonstrate the efficiency of various commercial fertilizers when applied with barnyard manure. In the variety tests Barbados Seedling 208 stood first, White Transparent second, and Barbados Seedling 147 third.

The culture of sugar cane and sugar beets in Egypt, M. Tinardon (*Ann. Min. Agr. [France], 21 (1902), No. 2, pp. 451–485, figs. 9*).—This report contains a general description of soil and climatic conditions in Egypt and gives an account of the culture of sugar cane and sugar beets. Analyses of soils, sugar cane, and sugar beets are reported.

Can wrapper leaf tobacco of the Sumatra type be raised at a profit in Connecticut? E. H. Jenkins (*Connecticut State Sta. Rpt. 1901, pt. 4, pp. 295–312*).—A reprint of Bulletin 137 of the station (E. S. R., 13, p. 947).

Culture and treatment of Dalmatian tobacco according to the Neumer method considered from a physiological standpoint, K. Preissecker (*Fachl. Mitt. K. K. Oesterr. Tabakregie, 1901, No. 1; abs. in Bot. Centbl., 89 (1902), No. 17, p. 511*).—The method described consists essentially in topping the tobacco plants when in full bloom and lifting the plants in order to break off the thinner roots. After 10 days the wilted leaves are gathered and dried in the sun. The author attributes a lighter weight of leaf and a higher percentage of mineral substance and resin to the change in transpiration and assimilation due to the lifting of the plants. This method is stated to be successfully practiced in a small district in Herzegovina.

Kansas and her wheats (*Kansas State Bd. Agr. Rpt. 1902, No. 81, pp. 1–197, figs. 28, maps 2*).—A collection of papers and abstracts dealing with the various phases of wheat culture in Kansas. The combined acreage and yield of winter and spring wheat for each county in 1901 is shown on a map. In addition to the discussions on the culture and uses of Kansas-grown wheat, the insect enemies of the crop are described and the experience and practice of wheat growing is reported by counties. The abstracts here given are mainly from bulletins of this Department and the experiment stations which have been previously noted.

Observations on wheat culture in 1902, DESPREZ (*Jour. Agr. Prat., n. ser., 4 (1902), No. 32, pp. 182, 183*).—This article is a general report on the experiments with wheat in 1902 at Cappelle. Soil, seeding, rotation, and cultivation are discussed. Attention is called to the progress made in the culture and improvement of wheat by referring to figures from the records of the station, which show that in 1852 Blé blanc de Flandre yielded from 1,600 to 2,400 kg. of grain and from 4,000 to 5,000 kg. of straw per hectare; in 1870 the yields varied from 2,400 to 3,000, and from 5,000 to 7,000 kg. of grain and straw respectively; and in 1896 the production ranged from 3,000 to 3,900 kg. of grain and from 7,000 to 8,600 kg. of straw per hectare.

Manure experiments with wheat, F. B. GUTHRIE and R. HELMS (*Agr. Gaz. New South Wales, 13 (1902), No. 6, pp. 661–666*).—Tabulated results of fertilizer experiments with wheat carried on at the Wagga Experimental Farm in 1901 are presented. The action of superphosphate was most marked, while sulphate of ammonia and potash had but very little effect. Superphosphate and Thomas phosphate gave about equal results.

HORTICULTURE.

A handy book of horticulture, F. C. HAYES (*London: John Murray, 1901, pp. 225, pls. 9, figs. 9*).—This book is not a scientific treatise on horticulture, but rather a popular, practical work, suitable for placing in the hands of beginners in gardening. In the first chapter the general principles of gardening are discussed and some practical notions given regarding the nature and management of soils, fertilizers, hotbeds, cold frames, garden pests, seeds, budding, etc. Part II discusses gardens and borders most suitable for different seasons of the year; here directions are given for the growing of roses, ferns, shrubs, climbers, vegetables, fruits, etc. Part III discusses the various types of hardy flowers, 21 different groups being noted. Part IV is a calendar of the garden for the different months. The work as a whole is very well adapted to the purpose for which it is written, viz, an introduction to the theory and practice of gardening.

Department of horticulture and gardening, G. COOTE (*Oregon Sta. Rpt. 1902, pp. 69–74*).—This is a brief report on the work of the horticulturist during the year, concisely indicating the results secured in tests of a large number of vegetables and small fruits. In a test of surface *v.* subirrigation for celery on a small scale, the results on the whole were in favor of surface irrigation. The Self-Blanching variety of celery proved a much earlier variety than the Golden Self-Blanching. Dry Weather cauliflower is stated to be especially adapted to the climate of the station, and has proved the best of all varieties tested for 3 years. It possesses the peculiarity of starting into new growth from the collar of the plant after the head has been cut away, thus producing a second crop during the latter part of August and first of September.

Electro-culture, S. LEMSTRÖM (*Gard. Chron., 3. ser., 32 (1902), No. 813, pp. 49, 50;*

Amer. Gard., 23 (1902), *No. 399, pp. 525, 526*).—The results of a number of experiments in the electro-culture of rye, barley, oats, wheat, and a number of garden crops are here briefly reported upon. In these experiments the growth of barley, wheat, and rye was increased 40 per cent by the aid of electricity obtained from a Holz machine. The plants were grown in pots. An isolated net of metal furnished with points was suspended above the pots, while the soil in the pots was connected with the ground by means of sheets of tin. In one series of pots the electricity passed from the wire net to the plants, in another series, the reverse direction was observed, while a third received no current whatever. Experiments on an extensive scale with garden crops gave an increase in yield as follows: Turnips, 107.2 per cent; potatoes, 76.2 per cent; mangel wurzels, 65.3 per cent; radishes, 59.1 per cent; parsnips, 54.5 per cent; leeks, 42.1 per cent, and white cabbage, 43.6 per cent. Strawberries subjected to the electro-culture ripened their crop in 26 to 33 days, while in control plats the crop was 54 days in maturing. It is believed that the time will eventually come when the use of electricity will be indispensable in the cultivation of various plants, like lettuce, asparagus, tomatoes, endives, cucumbers, radishes, etc., under glass in temperate climates during the winter season.

Note on some grafting experiments, R. H. Biffen (*Ann. Bot.*, 16 (1902), *No. 61, pp. 174–176*).—The outcome of a series of experiments to test the possibility of obtaining improved varieties of cultivated plants by grafting are reported. The most successful grafts were obtained by the use of seedlings having from 3 to 6 leaves, both for stocks and scions. Beets were one of the easiest plants to graft, nearly every graft being successful. The boundary line between the graft of different varieties of beets was very well marked in every instance, the crimson of the Mammoth Red not gradually blending with the white of the sugar beet. The grafted beets were slightly dwarfed in size. A light dwarfing tendency was noted when *Tropaeolum majus* was grafted on *T. canariense*, and vice versa. The flowering period was also retarded 6 to 8 weeks, and the grafted plants were especially subject to the attacks of slugs and caterpillars.

Radishes (*Raphanus raphanistrum*) were also seriously dwarfed and retarded in growth by grafting.

Successful grafts were also made between white (*Trifolium repens*), red (*T. pratense*), and alsike (*T. hybridum*) clovers; between red clover and alfalfa; red clover and sand clover (*Anthyllis vulneraria*); and between various Cruciferæ, as kale broccoli, and Brussel sprouts on cabbage, and vice versa.

This series of experiments is believed to confirm Daniel's work in showing that the effect of grafting is to dwarf growth, retard the flowering season, and in some cases render the plants more subject to the attacks of pests. In none of these experiments was there any visible effect of stock on scion, or vice versa. In grafting potatoes, however, having smooth green skin and deep eyes, upon potatoes with thick, rough, brown skin and shallow eyes, the same plant often produced tubers of both types. In some instances one end of the tubers resembled one type and the other end the other type. Sometimes there was a short constriction between the two ends, and again the yellowish green skin of one end gradually passed over into the rough, corky skin of the other, and the tubers were regular in shape. "Tubers in which the 2 types were blended never occurred." In halving the tubers transversely each portion was indistinguishable from one of its parents. The tubers showed all the characteristics of the parent, and not certain dominant ones. The graft hybrid is therefore not comparable with the sexually produced hybrid in this respect.

The propagation of plants, L. C. Corbett (*U. S. Dept. Agr., Farmers' Bul. 157, pp. 24, figs. 22*).—A popular discussion of the different methods of growing plants, more especially from cuttings and by layering, grafting, and budding. The details of these various operations are described and illustrated.

A comparative study of different colored glass for greenhouses, E. Zacharewicz (*Jour. Soc. Nat. Hort. France, 4. ser., 3 (1902), Apr., pp. 265–268*).—A brief review is given of earlier experiments by different workers along this line, and the author presents the results of his own work along the same line with strawberries. In this work the largest and greenest plants were obtained when yellow glass was used, but the quantity, size, and earliness of the fruit was decreased by the use of yellow-colored glass. The largest and earliest fruits were obtained by using colorless glass. The largest number of fruits was obtained when violet-colored glass was used. With this glass the size of the fruit was decreased, the quality injured, and the earliness retarded. Red, blue, and green glasses were all injurious to the vegetation of the plants. From these results the author concludes that in greenhouse work where foliage is desired, yellow glass may be used; but for the fruit the ordinary colorless glass is best.

Forcing tomatoes at the Iowa Experiment Station, H. C. Price (*Amer. Gard., 23 (1902), No. 394, p. 449, fig. 1*).—The results are given of a test of varieties of tomatoes for forcing in the greenhouse. The plants were set 15 in. apart and trained to a single stem on a trellis of wire. Lorillard and Holmes Supreme were the earliest varieties grown; Frogmore Selected furnished the most uniformly sized fruit; Mayflower, the largest number of large fruits; Holmes Supreme, the greatest amount of small unmarketable fruit, and Mayflower the most solid fruit. Frogmore Selected was the strongest grower of all the varieties tested, and Holmes Supreme the poorest grower. Frogmore Selected and Sutton Best of All gave the largest cash returns per plant. All things considered, it is stated that Frogmore Selected was the most satisfactory variety tested. The average cash returns with this variety was $2.53 per plant, while with Sutton Best of All it was $2.06.

Vegetables for a farmer's garden in northern Illinois, J. W. Lloyd (*Illinois Sta. Circ. 45, pp. 5*).—This gives an assortment of vegetables best suited for farmers' gardens in northern Illinois, indicates how they should be planted, and time of year when each will be available for table use.

Manuring fruit trees, J. P. Wagner (*Monatsber. Gesell. Förder. Wiss., Ackerb. u Künste, Unter-Elsass, 36 (1902), No. 5, pp. 145–172, figs. 6*).—A discussion of the principles of manuring fruit trees, with some illustrations and data showing the effect of fertilizing a few orchard fruits. The effect of different fertilizing elements on the growth of trees and production of fruits is brought out, and formulas given for the application of commercial fertilizers. As showing the advantages of fertilizing fruit trees, an instance is cited in which 6 pear trees that bore an excessive crop of fruit in 1900 were subjected to a fertilizer experiment. Four of the trees were well cleaned, pruned in the fall, and the ground under the trees well spaded. Each of these trees then received 5 kg. of slag, and 5 kg. of kainit. During the winter following each tree received 15 to 16 litres of night soil additional, and in the spring $\frac{1}{5}$ kg. of nitrate of soda. The 2 control trees received neither fertilizers nor other care. The manured trees fruited heavier, the fruits were more perfect, hung on better, and the foliage more luxuriant than on the trees not manured. Less fruit set on the unmanured trees, the foliage was ravaged by pests, and most of the fruit fell off before the middle of September. At a cost of a little more than $1 the fertilized trees gave an increase of 125 kg. of apples, having a value of about $7.50.

Observations on the fertilization of peach orchards, E. H. Jenkins (*Connecticut State Sta. Rpt. 1901, pt. 4, pp. 283–285*).—The season's record of 1901 is given of the number of baskets of fruit obtained, and the number of trees that have died, in the station peach orchard, which is being used to test the value of different combinations and amounts of commercial fertilizers for this fruit. The experiment began in 1896, and the records obtained have been published from time to time (E. S. R., 13, p. 138), but, as in the present case, without drawing conclusions. The following table gives a summary of the total number of trees that have died since the orchard was planted, the total yield obtained during the past 3 years on different plats, and the fertilizers that are being used on each plat. Each plat consists of 48 trees. Trees that die are replaced with others.

Yield of peaches on plats differently fertilized.

Plats.	Fertilizers used.	Total number of trees that have died.	Total number of baskets of fruit obtained in 3 years.
A	65 lbs. muriate of potash, 160 lbs. acid phosphate	31	271.75
B	65 lbs. muriate of potash, 160 lbs. acid phosphate, and 170 lbs. cotton-seed meal	16	428.50
C	65 lbs. muriate of potash, 160 lbs. acid phosphate	17	306.25
D	130 lbs. muriate of potash, 160 lbs. acid phosphate	14	413.50
E	260 lbs. muriate of potash, 160 lbs. acid phosphate	1	602.50
F	260 lbs. high-grade sulphate of potash, 160 lbs acid phosphate	2	556.75

The thinning of fruit, S. A. Beach (*California Fruit Grower, 29* (*1902*), *Nos. 727; 728, p. 4; 729, pp. 4, 5*).—This article includes the data on thinning apples previously presented by the author (E. S. R., 9, p. 448), and in addition the results of some experiments in thinning apricots, peaches, and plums. Early thinning, leaving the fruits in one instance at least 1 in. apart when ripened, and in another at least 2 in. apart, was practiced, as was also thinning 4 weeks later, leaving the fruits the same distances apart. The best results with apricots followed early thinning 2 in. apart. The fruits were thinned when they had attained about the size of hazelnuts. Like results are reported with plums. With both fruits there was an increase in the size of the thinned over the unthinned fruit, but in both years the yield was greater on the unthinned than on the thinned trees. Peaches were considerably increased in size by thinning and the early thinning appeared to be most effective for this purpose. The effect of thinning the first year was not as marked in increasing the yield on the same trees the following year as was anticipated. The author believes that pruning is the most economical method of thinning the crop whenever this appears necessary. In the light of the author's experiments, it is believed that thinning fruits in commerical orchards with the expectation of inducing regular bearing and increased yields in succeeding years is of doubtful value. Nevertheless, other evidence indicates "that systematic thinning of fruit, combined with skillful care in other directions, may materially strengthen the tendency of the tree to bear annually." Young trees, and sometimes older ones, may be severely impaired in vigor by maturing too heavy loads of fruit. Thinning should constitute the last resort, after all the details of fertilizing, cultivating, draining, pruning, etc., have been attended to.

Culture of the citrus in California, B. M. Lelong (*Sacramento: California State Bd. Hort 1902, rev. ed., pp. 267, pls. 27, figs. 85*).—This report contains a complete account of the culture of citrus fruits in California, from the early orchards to the present time. It includes a discussion of the methods observed by the best orchardists in propagating, planting, cultivating, irrigating, pruning, harvesting, and fertilizing oranges, lemons, citrons, and limes and an account of the diseases and insects affecting them. The varieties of the various citrus fruits are described more or less in detail. A chapter is given on the products of citrus fruits, such as perfumes, oils, acids, wines, essences, etc.

Report of the fruit expert, W. J. Allen (*Agr. Gaz. New South Wales, 13* (*1902*), *No. 5, pp. 506–528*).—A review is given of the various orchard fruits, including citrus fruits in certain instances, grown at the Wagga, Hawkesbury, Pera Bore, Moree, and

Wollongbar experimental farms. Lists of the varieties grown are cited in many instances, and notes given as to their character and growth.

The home fruit garden, L. C. Corbett (*U. S. Dept. Agr. Yearbook 1901, pp. 431–446*).—This article was published as a Farmers' Bulletin and has been noted as such (E. S. R., 14, p. 147).

The farmer's fruit garden, E. V. Stubenrauch (*Illinois Sta. Circ. 40, pp. 7, dgm. 1*).—Suggestions regarding kinds of fruit to plant, best methods of planting them, with a diagram showing the arrangement of a fruit garden of 1 acre.

List of fruits recommended for a farmer's garden of one acre in northern Illinois, W. S. Hotchkiss (*Illinois Sta. Circ. 42, pp. 4*).—The list includes the best varieties of apples, pears, peaches, plums, cherries, blackberries, grapes, and other small fruits, suitable for planting in northern Illinois.

Little-known fruit varieties considered worthy of wider dissemination, W. A. Taylor (*U. S. Dept. Agr. Yearbook 1901, pp. 381–392, pls. 7*).—Among the fruits mentioned and described are Ingram apple, McIntosh apple, Carman peach, Red June plum, Wickson plum, Downing grape, Mulgoba mango, and Advance loquat. Colored plates are given of these different fruits.

Commercial apple orcharding, G. B. Brackett (*U. S. Dept. Agr. Yearbook 1901, pp. 593–608, pls. 4*).—This is a popular discussion of the whole matter of apple growing, including soils, methods of planting, varieties valuable for commercial purposes, methods of cultivation and pruning, insects and diseases affecting, and the handling and disposition of the crop.

Grafting resisting apple scions (*Pacific Coast Fruit World, 13 (1902), No. 21, p. 18*).—An account of the importation from New Zealand of apple stocks resistant to the aphis. About 20 varieties were imported and have been grafted.

Fruit storage experiments, J. C. Blair (*Illinois Sta. Circ. 44, pp. 18, pls. 24*).—The details of construction are given of a fruit storage house erected by the station, and of 2 cellars so made that they would be suitable for fruit storage. A number of plates and figures illustrating different phases of the work are included. The fruit storage house was built to hold 2,500 bbls., and cost, when completed, $3,080.41. The details of construction were made as simple as possible in order to reduce the amount of expert service required to a minimum. Fruit growers in Illinois are allowed to store fruits in the building free of charge, subject to the rules of the station. The fruit stored during the first season with the results, and the temperature observations, are to form a subsequent report.

The experiments in preparing the cellars for cold storage have shown that where the stone walls of the cellar are made to form the walls of the storage room, or the bottom of the cellar is covered with nothing more than a 6-in. layer of cinders, the temperature can not be kept down when the outside and surrounding ground is above the desired temperature. The details of this work are to be published later.

Tinting ripe pickled olives, E. W. Hilgard (*California Fruit Grower, 27 (1902), No. 731, p. 8; Pacific Rural Press, 63 (1902), No. 22, pp. 360, 361*).—The author discusses the probable effect on the food value of olives by coloring them with a small amount of copperas or iron sulphate. The use of coloring matter or preservatives of any kind in food products is deprecated.

The art of canning and preserving as an industry, J. Pacrette (*Jersey City: Jules H. Dommergue, 1901, pp. 194+X, figs. 33*).—Recipes are given for preparing and processing candied, glacéed, and brandied fruits, sirups and fruit juices, cordials and marmelades, various spirits, puddings, vegetables of all kinds, fish, milk, meats (including game), sauces, soups, etc. A brief chapter on bacteriology as related to canning is included in the work.

Small fruits for the northern half of the State, and how to grow them, J. W. Lloyd (*Illinois Sta. Circ. 41, pp. 3*).—Brief cultural directions.

Strawberry culture in Mississippi, A. B. McKay (*Mississippi Sta. Bul. 75, pp. 15, figs. 7*).—Popular directions are here given for the location and planting of the strawberry bed, methods of cultivation, manuring, mulching, and gathering the fruit. Reliable sorts for culture in Mississippi are Hoffman, Cloud, Lady Thompson, Bubach, Gandy, Excelsior, and Klondyke. These varieties are briefly described. Of the newer varieties Hunn, Clarence, Noble, and Gardner, in the order named, are mentioned as very promising sorts. Cotton-seed hulls is stated to be the best of all the materials used at the station as a mulch for strawberries.

Growing strawberries under cloth, O. W. Blacknall (*Amer. Gard., 23* (*1902*), *No. 392, pp. 416–418*).—The author has successfully used thin muslin, known as tobacco-plant bed cloth, as a protection for strawberries. In his experience the berries grow larger, the blossoms are better pollenized, and the plants more productive under cloth than when grown in the open. The author considers also that the slight increase of warmth obtained by lessening the radiation at night was very beneficial to the growth of the strawberries. Taking one year with another, he estimates that this kind of protection adds from 50 to 100 per cent to the yield of berries, makes them larger and more reliable, and ripens them earlier. Care should be taken not to use a cloth too thick and impervious to sunlight. The tar-treated kind, such as is used in large quantities for tobacco-plant beds, is considered just right. The cloth is fastened down over the bed by driving 18 in. stakes into the ground about 1 ft. deep. A wire hook is attached to the top of the stakes, by which the plant cloth is held in place. The stakes are set the width of the cloth apart, in straight rows, and 54 in. apart in the row. The original cost of a protection of this kind is estimated at $150 per acre. The cloth lasts about 3 years, and the stakes, if carefully protected, from 5 to 10 years.

Houses for strawberry forcing (*Garden, 61* (*1902*), *No. 1592, p. 343*).—Low span-roofed houses are considered most suitable and economical when houses are built especially for forcing strawberries. Such houses are usually 100 to 200 ft. long, 10 ft. wide inside and 6 ft. high to the apex of the roof. A sunken path, 20 to 24 in. wide, runs down the center with 6 rows of pots on each side.

Cranberry culture in southeastern Massachusetts, J. Bursley (*Massachusetts State Bd. Agr. Rpt. 1901, pp. 389–397*).—Some statistics are given on the cranberry production of New England and suggestions made regarding the establishment of cranberry bogs and the culture of cranberries in southeastern Massachusetts.

Grapes, A. Dickens and G. O. Greene (*Kansas Sta. Bul. 110, pp. 223–250, pls. 2, figs. 6*).—This bulletin includes a discussion of the varieties of grapes best suited for culture at the Kansas Experiment Station, the results of a test of 6 different kinds of trellises for grapes, a test of the value of bagging grape fruit bunches, a classification of grapes with reference to the suitability of different varieties for culture in Kansas, brief descriptions of 145 varieties of grapes, and a chart showing when they were first in bloom, in full bloom, and out of bloom.

With such varieties as Green Mountain, Campbell Early, Brighton, Eldorado, Worden, Concord, Agawam, and Catawba, a succession may be secured from early in August until well into October. Among the perfectly hardy white varieties are Elvira, Martha, Faith, and Pearl. For table use and the family trade Brighton, Brilliant, Massasoit, Catawba, Woodruff, Wyoming, Berkman, Agawam, and Delaware, among the red grapes, are considered very satisfactory. Varieties and hybrids of the common wild grape (*Vitis riparia*) have stood severe droughts well and are recommended for testing in especially trying situations. Elvira, Grein Golden, Faith, and Pearl are perfectly hardy, regular and prolific in bearing. Marion has been the best of the pure Riparias.

Relative to pruning grapes in Kansas it is the judgment of the authors that the annual renewing of the entire arm is preferable to spur pruning.

But little difference has been noted in the productiveness of grapes on the different forms of trellises used. The bunches have been more easily cut from the high-renewal trellis than from the low trellis, and the period of ripening has been uniformly a few days earlier. The difference in time, however, has in no case exceeded a week. The quality of the grapes has been about the same on all the different trellises. The fruit was more subject to sunburn on the Kniffen 2-wire, 4-cane trellis than on any other. This was controlled by training the new growth over the bunches. The greatest amount of injury from birds occurred on the Kniffen 2-wire, 4-cane trellis and the Kniffen overhead telegraph trellis. The least injury from this source occurred on the umbrella and fan systems. The fan system is considered the most satisfactory for varieties that are not perfectly hardy, since the young canes can be readily laid down for winter protection. The high-renewal forms are thought preferable to the low-renewal fan systems for localities where fungus diseases are prevalent. On the whole, the trellis for the fan system of training is considered the simplest and cheapest in construction and is commended to Kansas growers.

Experiments in bagging the bunches of fruit with manila paper bags as a protection from the birds have shown results that justify this practice, especially when the grapes are grown for a fancy market or the home table. The cost for this work is about 1 ct. per pound of fruit. The lengthening of the season of fresh grapes by bagging was determined with a number of varieties to be as follows, expressed in days: Agawam, 2; Brighton, 15; Catawba, 0; Concord, 14; Delaware, 40; Diamond, 8; Eldorado, 28; and Moore Early, 20. With most varieties bagging improved the condition of the bunches, though in a few instances the varieties were not quite so highly colored and the flavor was not always up to the standard of the variety. The difference, however, in the color and flavor was so slight as not to injure the market value of the fruit.

A record is given of the injury sustained by the different varieties of grapes at the station during the winter of 1898–99, and of their subsequent growth. Tender grapes are trained according to the fan system and laid down and covered in winter.

Nitrate of soda in the culture of grapes, G. Chappaz (*Prog. Agr. et Vit. (Éd. L'Est), 23 (1902), No. 22, pp. 628–632*).—On a clay-lime soil, very stony and rich in potash, the effect of nitrate of soda on the yield of grapes and quality of wine produced was studied. Commercial fertilizers had never been used in the vineyard before and no manures had been applied for a long time. The control plat on which no fertilizers was used yielded 5,550 kg. per hectare, the wine from which analyzed 12.8° alcohol. The plat receiving nitrate of soda at the rate of 400 kg. per hectare yielded 8,510 kg. of grapes per hectare, the wine from which analyzed 12.6° alcohol. Superphosphate at the rate of 500 kg. per hectare was applied with the nitrate of soda, but when this same amount was used in connection with 300 kg. of sulphate of ammonia per hectare no increase in yield over the control plat was obtained. The important fact in the experiment is the increase of 2,960 kg. of grapes per hectare by the use of nitrate of soda without any material decrease in the quality of the wine produced.

Report of the viticultural expert, M. Blunno (*Agr. Gaz. New South Wales, 13 (1902), No. 5, pp. 528–537*).—This is a report of the viticultural expert for New South Wales. He notes that native white wines of the hock and muscat types have been produced rivaling those of European origin. Port and sherry wines, however, do not come up to the standard of the Portuguese and Spanish brands. A list of the phylloxera-resistant stocks grown at the Viticultural Station at Howlong is included in the report.

The home vineyard, with special reference to northern conditions, W. H. Ragan (*U. S. Dept. Agr., Farmers' Bul. 156, pp. 24, figs. 15*).—Popular directions are given in this bulletin for the planting and subsequent care of a small vineyard such as is likely to be desired by farmers for home use. Some of the best varieties for Northern planting are Concord, Worden, Moore, and Niagara.

Budding the black walnut (*Pacific Coast Fruit World, 13 (1902), No. 12, p. 6*).—It is stated that the California black walnut has been successfully budded with

Mayette and other good French varieties of soft shell walnut. Annular or ring budding is considered the safest plan of budding. Otherwise, the bud should be cut deep and the wood gouged out, the object being to get more of the inner bark surface.

Notes on the caoutchouc trees of the Amazon, J. HUBER (*Bul. Soc. Bot. France, 49 (1902), No. 1-2, pp. 43-51*).—A discussion is given of the botany of the various species and varieties of Hevea, Castilloa, Sapium, and other less well known caoutchouc trees.

The ether treatment of lilacs in the trade, F. LEDIEN (*Gartenwelt, 6 (1902), No. 19, pp. 219-221*).—The author states that the etherization of plants is being rapidly adopted in the German trade. The etherizing room used by a grower of lilacs is described. When etherized the middle of November, Charles X was ready to sell 24 days later; when etherized the first of December it was ready for market in 18 days. In November, 50 gm. of ether per hectoliter were used, and in December only 40 gm. The cost of etherizing was about 2½ cts. per pot. In these experiments only summer-planted lilacs were used. In tests at the experiment station in Dresden, both summer-planted and potted lilacs were used. The details of the station work are withheld for future publication, but it is stated that old plants which had been once etherized and forced, when heavily fertilized but not transplanted, responded readily to etherization again, and by the end of October were in full foliage—an important consideration when plants are sold in pots. It is stated that the foliage must be kept confined within certain bounds by pruning, as otherwise the flower buds are likely to remain undeveloped.

Key to garden classification of roses, L. BARRON (*Amer. Gard., 23 (1902), No. 377, p. 171*).—A key is given to summer flowering roses which bloom but once and to summer and autumn flowering roses which bloom more or less continuously.

Influence of stock on scion, J. DALLAS (*Amer. Gard., 23 (1902), No. 377, p. 166*).—When Ophirie, a coppery colored and cup-shaped rose, was used as a stock for Maréchal Niel it transmitted a large percentage of its character and color to the latter. The use of Lamarque, a pure white rose, as a stock for Maréchal Niel resulted in buds of normal size but almost white at the points. Cloth of Gold, when used as a stock for Maréchal Niel, produced flowers of the deepest yellow.

Horticultural monograph of the genus Deutzia, E. LEMOINE (*Jour. Soc. Nat. Hort. France, 4. ser., 3 (1902), Apr., pp. 298-314, figs. 2*).—This is confined to a study of the different species and varieties cultivated in the garden from the horticultural standpoint.

Native vines in Wyoming homes, A. NELSON (*Wyoming Sta. Bul. 50, pp. 15, pls. 9, figs. 2*).—This bulletin was written for the purpose of acquainting the people of the State with the valuable native vines that may be used in the adornment of their homes. General descriptions and cultural directions are given for the American ivy, Western clematis, River Bank grape (*Vitis vulpina*), wild hops, and wild balsam apple (*Micrampelis lobata*). Two valuable introduced species are the well-known morning glory and the moon vine, both of which do well in Wyoming.

The "why" of the late planting of dahlias, J. W. WITHERS (*Amer. Gard., 23 (1902), No. 386, pp. 318, 319*).—The author states that he has been successful in growing dahlias only when plantings were made after June 15. By planting late the injurious effects of the usual summer drought are largely obviated and the plant kept continually growing. This is considered to be the main reason of success in late planting.

A new yellow calla, E. O. ORPET (*Amer. Gard., 23 (1902), No. 395, p. 463, fig. 1*).—This calla is the result of crossing *Richardia elliotiana* with *R. albo-maculata*. It promises to be of considerable value for an outdoor summer plant. Dormant bulbs planted about the latter part of May flower freely until fall, when the tops are cut off with a scythe, the tubers thoroughly ripened, and then stored in the cellar like potatoes, until planting time again.

Leaf mold for orchids, E. O. ORPET (*Amer. Gard., 23 (1902), No. 399, p. 530*).—As the result of the author's experiments he considers leaf mold unsuited to the culture of orchids under the conditions prevailing in the United States.

The farmer's flower garden, A. C. BEAL (*Illinois Sta. Circ. 46, pp. 3*).—Suggestions as to the planting of hardy flowers and shrubs suitable for flower borders.

The window garden, A. C. BEAL (*Illinois Sta. Circ. 47, pp. 3*).—Brief notes on the flowers best suited for window gardens, with suggestions as to their planting and care.

FORESTRY.

Grazing in the forest reserves, F. ROTH (*U. S. Dept. Agr. Yearbook 1901, pp. 333–348, pls. 8*).—A general discussion is given of the function of forests and the object and character of forest reserves, after which the regulations for grazing in forest reserves are stated and the forms of permits shown. The extent of grazing in the forest reserves for the year 1901 is shown in tabular form, in which the number of sheep, cattle, and horses which were permitted to enter the different reserves are stated. The different methods of handling stock in the reserves and the effect on the range are shown, and to prevent the impairment of the reserves it is suggested that the ranges should be subdivided and each stock owner allowed a well-defined area. In addition it is recommended that a per capita tax or rental should be imposed on all stock grazing in the reserves.

Administration of the United States forest reserves, I, F. ROTH (*Forestry and Irrig., 8 (1902), No. 5, pp. 191–193*).—An outline is given of the organization and administration of the forest reserves of the United States.

New forest reserves (*Forestry and Irrig., 8 (1902), No. 5, pp. 187, 188, fig. 1*).—On April 16, 2 forest reserves were established by presidential proclamation in the sand-hill district of Nebraska. One of these, known as the Dismal River Reserve, contains 86,000 acres; and the other, called the Niobrara Reserve, contains 125,000 acres. These reserves lie near the center of the great sand-hill district, which includes nearly one-fourth of Nebraska. The main purpose of establishing these reserves is to try on a large scale the practicability of forestation. The conditions seem favorable, and it has been proved that the region is adapted to the growth of pine timber. The demand for timber in the region is great, and the main question hinges upon the development of a practicable and economical method of getting the forest started. On April 11 the San Isabel Forest Reserve, containing 77,980 acres, in south-central Colorado, was formally established by presidential proclamation, and a few days later the San Francisco Mountains Forest Reserve of Arizona was increased by 999,950 acres. With these new reserves and the increases of the older ones, the total area of all the forest reserves of the United States is now 48,002,101 acres.

The timber resources of Nebraska, W. L. HALL (*U. S. Dept. Agr. Yearbook 1901, pp. 207–216, pls. 6*).—A review is given of the timber resources of Nebraska, in which attention is called to the ratio of planted timber to natural forest. Probably in no other State is there relatively as much planted timber as in Nebraska, the ratio being nearly 1 acre of planted timber to 8 acres of natural forest. A description is given of the distribution, character, and extent of the natural forests, and an account of the various attempts at tree planting is outlined. The value of timber for wind protection, shade, fuel, and construction purposes is briefly shown, and as indicating the commercial value of planted timber an account is given of the returns from a 3-acre cottonwood grove planted in 1860. This tract has yielded an annual profit of $5.32. The experiments being conducted by the Bureau of Forestry of this Department in reforesting the sand-hill region of western Nebraska are briefly described.

Forestry in Minnesota, S. B. GREEN (*Minneapolis: Geol. and Nat. Hist. Survey of Minnesota, 1902, pp. 401, pls. 63*).—This is a revised edition of the manual on forestry in Minnesota previously noted (E. S. R., 10, p. 856). This edition covers all the ground of the first, but the matter has been reclassified and a considerable extension of material is provided. New chapters are given on forest mensuration, forest problems in Minnesota, forest economics, etc.

A working plan for southern hardwoods and its results, J. FOLEY (*U. S. Dept. Agr. Yearbook 1901, pp. 471-476, pls. 3*).—An outline is given of a working plan established by the Bureau of Forestry of this Department for a tract of land owned by The University of the South, at Sewanee, Tenn. The forest comprises 7,255 acres, of which 6,555 are wooded. The more important trees are walnuts, hickories, oaks, tulip, and basswood. Under the method of treatment recommended, the revenue obtained in the first 9 months of management was $1,314.61. This revenue was considered satisfactory by the owners, and the statement is made that it was obtained with little or no injury to the forest and equaled that which would have been secured under the usual methods of lumbering.

The improvement of uncultivated farm land, E. H. JENKINS (*Connecticut State Sta. Rpt. 1901, pt. 4, pp. 350-352*).—A brief outline is given of the work which has been recently undertaken by the station in studying means of improving the waste farm lands of the State. This work will not only include forestry and tree planting, but also the cropping and grazing of waste lands for their improvement. Primarily the station work is being conducted in the interest of the individual holders of woodland, pastures, and other waste lands, which are at present nearly worthless.

Annual report of the forester, W. MULFORD (*Connecticut State Sta. Rpt. 1901, pt. 4, pp. 353-364, pls. 3*).—The station has undertaken 2 lines of work, the first of which is considered station work proper, and is outlined in the report on the improvement of uncultivated land (see above); while the second line of work is carried on under the act of the general assembly concerning the reforestation of barren lands. At present studies on the condition of the woodland and idle land are being conducted, and work begun in reclaiming the waste land, in the treatment of woodland to improve its present condition, and in the dissemination of information regarding forestry. Under these different headings the details of the work are described. The act of the general assembly of the State providing for the forest work is given and commented upon.

Fire and the forest reserves, C. S. NEWHALL (*Forum, 33 (1902), No. 1, pp. 109-120*).—The author discusses the harm arising from forest fires, their sources, and the means to be taken for the protection of forests against fires, and the resources for combating forest fires.

Forest fires during June (*Forestry and Irrig., 8 (1902), No. 7, pp. 296-298, figs. 2*).—A compilation is given showing the extent of forest fires during the month of June, 1902. The damage to standing timber is conservatively estimated at $5,000,000, most of which was done in the States of Washington, Colorado, and California.

Practical sylviculture, G. VERT (*Bol. Agr. São Paulo, 3. ser., 1902, No. 5, pp. 340-343*).—Brief directions are given for the planting, organization, and exploitation of forests in Brazil. The yearly growth of a number of varieties of trees is shown, and suggestions given for their proper rotation in a conservative system of forestry.

Forest trees adapted to Chile, F. ALBERT (*Los bosques en el país. Santiago de Chile: Imprenta Moderna, 1901-2, pp. 184, figs. 55*).—After a historical review of the forest conditions of Chile and the present status of forestry, descriptions are given of the indigenous species, as well as of a large number of foreign species which are thought to be suitable for introduction in that country.

White pine planting in New England, H. B. KEMPTON (*Forestry and Irrig., 8 (1902), No. 7, pp. 288-291, figs. 3*).—It is stated that the tree most commonly used for forest planting and which gives the best results in New England is the white pine. This is due to its adaptability to various conditions of soil and climate, its rapid growth, and the value of its timber. The various plantings of white pine in New England are divided into watershed plantings, plantings on sand barrens and seaside dunes, on bare lands and worn-out pastures, on cut-over land, and planting for the home wood lot. The value of the pine for these different plantings is shown, and it is stated that in many regions the bare lands are slowly being covered by a natural growth of white pine. The most practical forest planting for the general public is said to be the home wood lot. When combined in wood lot and windbreak, the protection afforded is of great value, and the excess of posts and fuel will be readily marketable for those living near the towns.

The Pinus attenuata as a water conserver, T. P. Lukens (*Forestry and Irrig., 8 (1902), No. 6, pp. 246–249, figs. 3*).—A description is given of *Pinus attenuata*, or *P. tuberculata*, as it is more commonly called, and attention drawn to its value as a forest cover for protecting the slopes of the mountains in California. On account of the peculiar manner in which the cones of this tree are produced its distribution seems to be very little affected by fires. There seems to be evidence that, in some instances at least, fires have proved advantageous in spreading this tree, by causing the cones to open and distribute their seed. The heat of the fire, while it may destroy the tree, melts the resin with which the cone is sealed, and within a few days after the fire the winged seeds are scattered over a greater area than that over which the trees previously existed. A peculiarity of this tree is that the cones are frequently inclosed by the growth of the tree, precluding its use for timber. The principal usefulness of this species is that of a water conserver and to prevent erosion. The seeds of this species retain their vitality for a long time, fertile seed having been found in cones almost surrounded by the growth of the trunk of the tree.

The red cedar in Nebraska, L. C. Miller (*Forestry and Irrig., 8 (1902), No. 7, pp. 282–285, figs. 2*).—An account is given of the distribution and reproduction of the red cedar in Nebraska. The reproduction of red cedar is said to be good. In no locality where seed trees occur is reproduction lacking, but where seed trees are scarce the young growth is naturally limited. The planting of the red cedar on a large scale has not yet been undertaken, but from experiments that have been conducted it is believed that excellent results will be obtained in planting this tree over a considerable portion of the State. The adaptability of the red cedar to various soils and its value for fence posts, telegraph, telephone, and electric-light poles, and railroad ties are believed to be so great as to result in its wide future planting throughout the State.

Taxodium distichum and related species, with notes on some geological factors influencing their distribution, R. M. Harper (*Bul. Torrey Bot. Club, 29 (1902), No. 6, pp. 383–399*).—The results of field observations on the bald cypress have led the author to the conclusion that there are at least 2 well-marked species in the southeastern United States. In addition to the well-known species, *Taxodium distichum*, the author proposes a second species, *T. imbricarium*, which is common in swamps and ponds from Florida to North Carolina, etc.

A notable California fir, W. R. Dudley (*Forestry and Irrig., 8 (1902), No. 5, pp. 193–198, figs 4*).—An account is given of the distribution and characteristics of what is known as the Santa Lucia silver fir (*Abies venusta*). The author shows that this fir is distributed over a considerably wider area than has been previously known, and it is believed that this species will prove one of the best for propagation over large rocky tracts where few other trees naturally grow. It should probably be accompanied by such hard woods as tan bark and Valparaiso oaks, both of which are of great economic value.

A volatile oil in the wood of Cryptomeria japonica, C. Kimoto (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), No. 5, pp. 403–405*).—The wood of this highly prized coniferous tree is said to possess an agreeable odor, something like that of peppermint, and is extensively used as a material for the manufacture of sake casks. The sake stored in them acquires a peculiarly agreeable aroma, which is supposed to be due to the presence of some principle in the wood. In order to ascertain the nature of this principle, the author distilled 2 kg. of the wood and obtained 13 cc. of an oily substance, which had the characteristic smell of the original wood. This was subjected to a fractional distillation, the greatest quantity coming off at a temperature of between 260 and 270° C. To this the author has given the name sugiol, from the Japanese name of the tree. It is an oil of neutral reaction, almost completely insoluble in water, but readily soluble in alcohol, ether, and chloroform. Its boiling point is 264° C. and specific gravity 0.935.

The effect of lightning on trees, D. T. MacDougal (*Jour. New York Bot. Gard., 3 (1902), No. 31, pp. 131–135*).—The effect of lightning on a number of trees in the New York Botanical Garden is described, and an examination showed that the part of the tree containing the greatest proportion of starch, glucose, or other sugars offers the least resistance to the passage of electric currents, and the parts containing oily material offers the greatest resistance. In consequence, lightning discharges generally pass through a tree trunk in the growing layers and sap wood, and the actual amount of mechanical injury will depend upon the size of the discharging flash. A more or less constant discharge is said to be taking place through trees, and it is only when the difference in potential becomes very great that a lightning stroke results.

The work in dendro-chemistry, W. H. Krug (*Forestry and Irrig., 8 (1902), No. 5, pp. 202–205*).—An outline is given of proposed investigations in the laboratory which has been established in connection with the Bureau of Chemistry of this Department. The first work taken up by the laboratory was the study of the chemical composition of the wood and bark of a number of species of oaks, to which have been added the investigations of the Western hemlock, and other species will be taken up in time.

The lumber industry, H. Gannett (*Twelfth Census United States, Census Bul. 203, pp. 97*).—According to this bulletin, at the time the twelfth census was taken there were 33,035 establishments engaged in the lumber industry in the United States. The amount of lumber produced by mills was 35,084,166 ft. B. M., valued at $566,832,984. Comparative summaries are drawn showing the condition of the lumber industry as revealed by the different census reports from 1850 to 1900. The ownership, capital, and product of the different establishments are shown, together with the different logging establishments, sawmills, shingle, and planing mills. The different timber regions of the United States are outlined, and statements given relative to the average stand of the timber and its ownership. The distribution and cut of the more important woods, such as white pine, spruce, hemlock, cypress, Southern yellow pine, Western yellow pine, sugar pine, red fir, redwood, and hard woods are given, and the timber regions of the different States described.

SEEDS—WEEDS.

Agricultural seeds—where grown and how handled, A. J. Pieters (*U. S. Dept. Agr. Yearbook 1901, pp. 233–256, pls. 4, figs. 2*).—A brief review is given of the production of agricultural seeds in the United States, the centers of production of a number of the more important varieties being given. The seed production of different cereals, clovers, grasses, fiber plants, and miscellaneous agricultural products is briefly described, the distribution indicated, and methods of harvesting shown. Charts are given showing the distribution of seed-producing centers throughout the United States.

A test of the vitality of seed corn, A. D. SHAMEL (*Illinois Sta. Circ. 49, pp. 4*).—A method of testing the vitality of seed corn is outlined and the application of the results suggested.

Tests of the vitality of vegetable seeds, E. H. JENKINS (*Connecticut State Sta. Rpt. 1901, pt. 4, pp. 286–294*).—In continuation of the previous report (E. S. R., 12, p. 563), the results of testing 689 samples of vegetable seeds are given. Tables presented showing the average, maximum, and minimum vitality of all seeds tested at the station since the adoption of the methods of testing recommended by the Association of American Agricultural Colleges and Experiment Stations. A report is also given on the vitality of onion seed as affected by age, as well as comparisons between California and Connecticut grown seed. As in the previous report the vitality of the California-grown seed surpasses that of the local-grown. A report is given showing the vitality of Connecticut-grown onion seed of various crops from 1894 to 1900, in which considerable fluctuation in the average germination is shown. As in the previous report, differences are observed in the sprouting capacity of different varieties of onion seed, the White Portugal appearing to be distinctly inferior to the other varieties.

Conditions influencing the vitality and germination of seeds, J. W. T. DUVEL (*Abs. in Science, n. ser., 16 (1902), No. 395, p. 137*).—The effect of various climatic conditions, especially the deleterious influence of warm, moist climates on the vitality of seed, is shown. Necessary conditions for keeping seed in such unfavorable climates were discussed at some length, showing that the first requisite for prolonged vitality of seed is a reduction in the amount of hygroscopic moisture present, thereby diminishing the respiratory activity and consequently prolonging the life of the seeds.

The removal of the wings from the seeds of conifers, F. MAIN (*Jour. Agr. Prat., n. ser., 4 (1902), No. 40, pp. 436–438*).—The wings which occur on the seed of many species of conifers to aid in their natural dissemination, are said to be more or less troublesome in handling the seed and in sowing them in nurseries. On this account various mechanical means have been suggested for the removal of the seed wings, and a method in use in France is described at considerable length.

The destruction of weeds, G. HEUZÉ (*Jour. Agr. Prat., n. ser., 4 (1902), Nos. 35, pp. 283–285; 41, pp. 473, 474*).—Descriptions are given of a number of troublesome weeds and suggestions for their eradication.

DISEASES OF PLANTS.

Notes on plant diseases, F. D. CHESTER (*Delaware Sta. Bul. 57, pp. 16, figs. 6*).—Notes are given on some diseases of cantaloupes, pear and apple canker, treatment of asparagus rust, winterkilling of dewberries, sun scald of Japanese plums, and fire blight of pears. The portions of the bulletin describing the diseases of cantaloupes and pear canker are essentially reprinted from the Annual Report of the Station (E. S. R., 14, p. 260). For the prevention of the leaf blights of cantaloupes thorough spraying with Bordeaux mixture at intervals of 2 weeks during the growing season is recommended. For the prevention of stigmonose spraying with kerosene emulsion or other insecticide for the destruction of melon aphis is advised. For the pear canker the formaldehyde-glycerin treatment is again recommended as the most efficient remedy.

In 1901 the asparagus rust was less destructive than during the 2 preceding summers, but was serious enough to demand careful investigation. Asparagus was sprayed with Bordeaux mixture, to which 2 lbs. of resin soap was added to each barrel of fungicide. The results warrant the recommendation of this treatment as a rust preventive; it should be used wherever the rust has been especially troublesome the previous season.

The winterkilling of dewberries has been under investigation. It is believed that the weather conditions are not the primary cause of the destruction of plants, but that it is due to a weakened condition of the vines brought about by attacks of parasitic fungi. Tying up the vines too early in the season is not advisable, and the middle of April is believed to be a better time than the middle of March. If delayed until this time there is not the liability to the destructive action of the high, dry winds of the early spring.

The sun scald of the Japanese plum has been called to the author's attention for a number of seasons, and the disease seems to be of considerable importance. The trouble begins in longitudinal cracks in the south side of the body of the tree, and continues until the trunk is more or less decayed. The cause of the cracking of the bark is the successive freezing and thawing, which is most marked on the side exposed to the sun's rays. It may be prevented by protecting the south side of the tree, by heading the trees low so that the tops will shade the body, by giving the trees a slight inclination to the south, thus keeping off the full force of the sun, or by sheltering by mechanical means.

The control of fire blight of pears is said to be one of great practical importance to the fruit growers of Delaware, and the value of pruning is shown. Two spring prunings are recommended, the first before the blossoms open and the second about a month after blossoming, to be followed by a third inspection in the fall before the leaves drop, cutting out at this time all evidence of blight which may have escaped the previous operation.

A new bacterial disease of the potato, G. DELACROIX (*Bul. Min. Agr.* [*France*], *20* (*1901*), *No. 5, pp. 1013–1033*).—This disease, which has been noted previously (E. S. R., 13, p. 864; 14, p. 263), is reported upon at some length, the author giving the results of his investigations made at the request of the Minister of Agriculture. An historical statement is given relative to the appearance and distribution of the disease, which it is believed has long been present in Ireland as well as in Germany. The characters of the disease, which is due to *Bacillus solanincola*, are described. In addition to attacking the potato, the tomato is said to be subject to the disease, exhibiting the same symptoms, although being more resistant than the potato. The organism causing the disease is described at length, and it is said that there is frequently associated with it the mycelium of a number of fungi. Among those noted are a species of Fusarium which is quite similar to *Fusarium lycopersici*, the sclerotia and mycelia of a species of Vermicularia and of *Torula convoluta*, and a sterile form which seems to be identical with *Rhizoctonia solani*. Of these the Rhizoctonia is thought to be the only parasitic form, the others being present as saprophytes. Infection experiments were conducted with the bacteria as well as the fungi, and the disease was produced in stems artificially inoculated with the bacteria, but the experiments with the other organisms gave negative results. The conditions for infection seem to require a humid spring which is late and cold, followed suddenly by very hot, dry weather. Marked differences are noted as to the susceptibility of different varieties of potatoes to the disease, the early ones being particularly subject to injury. Contrasting characters are presented by which this disease may be differentiated from other fungus and bacterial diseases of the potato. When first discovered, the author considered the organism identical with that described by E. F. Smith as causing a bacterial disease of tomato, eggplant, and Irish potato (E. S. R., 8, p. 895), but subsequent investigations show that the organism described by Smith develops rapidly and produces a great number of bacteria in the vessels of the plant, but does not produce thyles nor gum, while the organism of the new disease liquefies gelatin in cultures. A series of experiments was undertaken for the control of the disease, and the author recommends the selection of sound tubers for planting or of tubers from noninfested regions, a 4-year rotation of crops, and the planting of entire tubers, which should be treated before planting by immersion for an hour and a half in a 1:120 solution of formalin. The plantings should be made as late as possible to insure the ripening of the crop.

Concerning the bacterial disease of the potato, E. Marre (*Prog. Agr. et Vit. (Éd. L'Est), 23 (1902), Nos. 14, pp. 415-417; 15, pp. 439-443; 16, pp. 462-470*).—A description is given of the bacterial disease of potatoes caused by *Bacillus solanincola.* This disease is said to have made a sudden appearance early in August, 1901, and it is reported as having been observed to a more or less extent in 20 departments of France. The characteristics of the disease and descriptions of the organism are given at some length, the previous publications of Delacroix being drawn upon. Although only recently demanding attention, this disease is said to have been known for a number of years, and quite a number of local names are given which are more or less descriptive of it. The conditions for the development of the disease and its spread and treatment are discussed at some length.

Concerning a bacterial disease of the potato, A. Carré (*Prog. Agr. et Vit. (Éd. L'Est), 23 (1902), No. 15, pp. 429-430*).—In a brief note the author calls attention to the presence of a bacterial disease of potatoes recently described by Delacroix (see above), and suggests the stimulation of the growth of potatoes by the application of fertilizers, particularly those containing superphosphates, as a means for combating the disease.

Some diseases of the sugar beet, C. O. Townsend (*U. S. Dept. Agr. Rpt. 72, pp. 90-101, pls. 4*).—Popular descriptions are given of a number of the more injurious diseases of the sugar beet, and so far as known directions are given for their prevention. Among the diseases described are damping off, curly top or blight (also called Western blight, bacteriosis, and California beet disease), leaf spot, leaf rust, leaf scorch, crown rot, root rot, scab, and crown gall.

Field treatment of cane cuttings in reference to fungus diseases, A. Howard (*West Indian Bul., 3 (1902), No. 1, pp. 73-86*).—The author's attention has been called to the fact that many cane cuttings either do not grow at all when planted or the young shoots die shortly after their appearance above ground. In some plantations as much as 30 per cent of the cuttings fail to grow. This loss is generally attributed to drought, but a careful examination showed that the loss was doubtless due to the presence of fungi. The fungus found is believed to be identical with that which causes the disease of cane cuttings in Java, known as the pineapple disease. For the protection of cuttings against this fungus (*Thielariopsis ethaceticus*) it has been recommended in Java that the cut ends of the cuttings be coated with tar before planting. The author has investigated the value of such treatment, also the treatment of the cuttings with Bordeaux mixture, and Bordeaux mixture and tar. The results showed that Bordeaux mixture alone or in combination with the tar is very effective in preventing infection, and is considerably better than tar used alone. The relative value of tops and cuttings of the lower part of the cane for seed purposes was tested, and it was found that the tops were much less liable to disease than the lower cuttings. This is explained by the difference in the sugar content of the lower and upper part of the cane. The greater amount of the sugar in the lower cuttings is believed to favor the development of the fungus. The cost of treatment of cuttings with Bordeaux mixture and tar would be about $12 per hundred acres where the cuttings are planted at the rate of 1,200 per acre. It is recommended that in exchanging cuttings from one country to another they be treated with the Bordeaux mixture and tar solution prior to shipment. A brief bibliography of the subject concludes the bulletin.

The root disease of sugar cane (*Agr. News [Barbados], 1 (1902), No. 1, p. 3*).—An account is given of experiments for the prevention of the growth of the fungus *Marasmius* sp. On account of the economic importance of this root disease, experiments were made in which plats of 100 holes each of first-crop cane attacked by the disease were treated by stripping the canes and spraying with Bordeaux mixture, stripping and spraying with Bordeaux mixture and the application of lime, stripping and liming, and untreated. The canes were planted October 17, 1901, and cut and weighed February 27, 1902. The results of the experiment show that none of the treatments is of any practicable use. Indirect methods must be adopted for the control of this disease, among them rotation of crops and trenching about diseased areas to prevent the further spread. After cutting the cane the stumps should be collected and burned, together with all the trash remaining on the field. In connection with the crop rotation, attention is called to the fact that sweet potatoes are probably affected by the same fungus as that occurring upon the cane.

A foot rot of wheat, A. B. CORDLEY (*Oregon Sta. Rpt. 1902, pp. 66, 67*).—A disease of wheat is described as occurring in a number of regions in Oregon in which every stalk is infested at the base by a fungus, and the plants are seriously injured. The disease is characterized by a blackening of the tissues in the lower part of the stem, and microscopic examination showed the presence of a fungus mycelium which as yet has not been determined. Whether the disease is a new one or not and whether it is liable to become of economic importance are subjects for further investigation.

Inquiry concerning amount of loss from smut of wheat and oats in Illinois, A. D. SHAMEL (*Illinois Sta. Circs. 54, 55, pp. 3 each, fig. 1 each*).—Brief descriptions are given of the smuts of wheat and oats. In order to secure data relative to the prevalence of these diseases and the loss occasioned by them, reports of the percentages of smut are requested in the circulars.

The gummosis of fruit trees, P. PASSY (*Rev. Hort* [*Paris*], *74* (*1902*), *No. 11, pp. 269, 270*).—A description is given of gummosis, the real cause of which the author says is probably not known. It manifests itself by the accumulation in cavities under the bark of a substance analogous to gum arabic and which results in the breaking down of the cells of the plant, particularly of the medullary rays. Humidity of soil, sudden variations in temperature, the destruction of the foliage, or other factors which bring about marked physiological changes in the plant seem to favor the production of the gummosis. In addition to these physiological causes, the author states that certain fungi, among them *Coryneum beyerinckii*, are able to produce similar conditions in certain of the stone fruits. Marked differences are noted of the susceptibility of different varieties of stone fruits, peaches being exceptionally susceptible, while apricots and cherries continue to live for a long time after being attacked. As preventive measures the author recommends the aeration and proper draining of the soil and subsoil in order to secure a better development of the trees and, where the disease is due to attacks of fungi, spraying with Bordeaux mixture.

Field work with bitter rot during 1901, J. C. BLAIR and A. V. STEUBENRAUCH (*Illinois Sta. Circ. 43, pp. 27, figs. 2*).—An account is given of field work undertaken in cooperation with the Division of Vegetable Physiology and Pathology of this Department. The efficiency of Bordeaux mixture was tested and information sought regarding the value of winter treatments, of early spraying, and the relative value of other fungicides in controlling this disease. The work was conducted by a number of individuals under the immediate direction of the horticulturist, and the results indicate that Bordeaux mixture when properly made and applied will protect apples to a reasonable extent from bitter rot. The winter treatment of dormant trees seems to be of no practical assistance in checking the disease, and early sprayings are no more advantageous than reasonably late sprayings. In the comparative tests of fungicides, Bordeaux mixture was found superior to the ammoniacal copper carbonate solution.

Prevention of bitter rot, T. J. BURRILL and J. C. BLAIR (*Illinois Sta. Circ. 58, pp. 3*) —The object of this circular is to call attention to a recent discovery which seems to give an opportunity for combating the bitter rot of apples. In general it may be said that the distribution of the disease in the tree shows a conical shaped area with the apex upward. The primary infection occurs at the apex of this cone and this infection is said to start from a canker upon the limbs of the tree. These cankers are described, and as preventive measures it is recommended that the trees should be carefully examined, the infected spots cut out, and the diseased material burned.

Cockscomb fasciation of pineapples, J. W. HARSHBERGER (*Proc. Acad. Nat. Sci. Philadelphia, 1901, pp. 609–611, fig. 1*).—A remarkable case of fasciation of pineapple is described in which several pineapples produced on a single plant were united into a fan-like mass of considerable size. The monstrosity had a pleasant aroma, was succulent, but very fibrous.

A preliminary report on the nature of the banana disease prevalent at Alexandria, LOOSS and G. P. FOADEN (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1902*), *No. 4, pp. 844–848*).—A description is given of a nematode disease of bananas which has previously been described from another source (E. S. R., 14, p. 264).

How fungi gain entrance to living trees, J. W. HARSHBERGER (*Forest Leaves, 8* (*1901*), *No. 6, pp. 88–91*).—A discussion is given of the means of infection of living trees either by the natural growth of the fungus or through mechanical, meteorological, or chemical injuries, as well as injuries produced by grafting and budding.

Canker of oak trees, M. C. POTTER (*Trans. Eng. Arboricult. Soc. 1901–1902, p. 105, figs. 4; abs. in Bot. Centbl., 89* (*1902*), *No. 16, p. 463*).—Cankered oak trees, *Quercus robur*, are said to be common in the north of England. The canker begins at the insertion of a dead branch, and passes thence to the living wood. The disease is characterized by a brownish discoloration of the medullary rays. Spores sown upon sterile oak blocks developed, producing mycelium, and finally the form by which the affinities of the fungus was determined. It proved to be a new species of Stereum, to which the name *S. quercinum* is given.

A bacterial blight of strawberry, A. B. CORDLEY (*Oregon Sta. Rpt. 1902, pp. 61–64*).—During the autumn of 1901 strawberry plants were noted that were apparenty suffering from bacterial disease. Many of the leaves were entirely dead, dark brown in color, and leathery in texture. On other leaves the dead areas were observed between the principal veins, and blackened and shrunken spots were also observed on the stems. A careful microscopic examination of the diseased material failed to show the presence of any fungus, but when examined bacteriologically it was found to be infected with a Micrococcus. This was isolated and cultivated in a number of media. Plants inoculated with pure cultures when placed under bell jars showed the characteristics of the disease within 48 hours. In 1902 the disease reappeared, and when examined the Micrococcus was found again present. The organism apparently is distinctly aerobic, and whether the disease is to be considered a serious enemy to strawberry culture or only a sporadic attack can not be determined at present.

Experiments for the prevention of mildew, L. RAVAZ and A. BONNET (*Prog. Agr. et Vit.* (*Éd. L'Est*), *23* (*1902*), *No. 13, pp. 372–379*).—A report is given in which the efficiency of copper and cadmium salts, of different copper fungicides, and the action of copper on the growth of a vine were studied. In experiments to compare sulphate of copper and sulphate of cadmium, a simple solution of each salt was tested, as well as a solution containing lime to which was added 0.5, 1, and 2 per cent of the salts. These different solutions were applied to equal plats of grapevines upon 4 occasions, and the efficiency noted at the end of the season. Upon the untreated plats the mildew proved quite destructive, but the different fungicides, with the exception of the simple solution of copper sulphate, proved equally efficient in preventing the attacks of the fungus. In the second series of experiments reported, in which the efficiency and adhesiveness of fungicides were tested, comparisons were made between Bordeaux mixture, Burgundy mixture, Bordeaux mixture containing turpentine, and Bordeaux mixture to which resin was added, a verdigris solution, and a simple solution of copper sulphate. All of these fungicides were sprayed over grapes, 3 applications being given, the first upon May 14. An examination was made of the foliage on October 30 and but little difference was noted in the adhesiveness of the different fungicides, except the simple solution of copper sulphate. There was some difference noted where 2 applications were given, the most adhesive being the Bordeaux mixture containing resin, but where 3 applications were given the vines the relative efficiency of all was the same. The effect of copper and cadmium upon the growth of plants is discussed at some length, quotations being given from a number of authors regarding the effects of these fungicides. In a limited experiment to test the number of organisms developed on the leaves when treated with copper and cadmium, the average results obtained were the same.

The influence of the gray rot of grapes on the yield and quality of wine, A. Muntz (*Ann. Agron., 28 (1902), No. 4, pp. 177–208*).—The season of 1900, according to the author, was abnormal in many ways. The summer was unusually hot and the grape crop extraordinarily abundant in every grape district of France. The period of ripening of the grapes was considerably delayed by fogs and rain, and at the time of harvesting in some regions the gray rot (*Botrytis cinerea*) was so bad that nearly the whole crop was destroyed. In other regions where the grapes were used in making wine the quality was said to be very inferior. The author studied the effect of this fungus as shown in the wine of a certain region, and gives the results of his investigations, which were quite extensively pursued. The attack of the fungus was found to reduce the amount of grapes gathered, and also lowered the amount of wine produced from a given amount of grapes. There was a marked reduction of the alcohol and tartaric acid, due to the same cause. The color of the wine was likewise affected, the clear vinous color of the wine from sound grapes being changed to a brownish color, and finally to a peculiar yellowish liquid having little resemblance to wine, the degree of the alteration being due to the stage of the disease. The tannin content of wine was greatly reduced by the presence of the fungus, and the actual loss due to this cause is estimated at 30 per cent of the wine production. Among the practical suggestions of the author to be followed upon the recurrence of similar conditions, it is recommended that upon the appearance of disease the grapes should be immediately cut, as delay only tends to increase the loss. Where the disease is present it will be found advantageous to collect only the sound grapes or, where it is possible, to make white rather than red wine. Other suggestions are given for the handling and final disposition of the wine.

Development of black rot, A. Prunet (*Jour. Agr. Prat., n. ser., 3 (1902), No. 21, pp. 674–676*).—As a result of 5 years' investigations on the development of the black rot fungus (*Guignardia* or *Læstadia bidwellii*), the author states that the fungus does not winter on the host plant but is carried over in the sclerotia which form in great abundance on the diseased grapes. The sclerotia germinating in the spring have their spores transferred to the green parts of the vine, forming the first or, as the author calls it, the primary attack of the black rot. The attacks which arise from the development of the fungus on the grape leaves are called secondary. The time of appearance of the different invasions has been investigated, and the first seems to occur between April 20 and 25. The secondary attacks occur at different intervals during the growing season. The length of the period of incubation depends largely upon the temperature. In general, it is from 16 to 22 days in April and May, 14 to 16 days in June, and 10 to 14 in July and August. Drought or low temperature retards the formation of the pycnidia and, so far as the author's observations go, fogs are not beneficial to the development of black rot, although favoring that of the mildew. For the black rot, rain appears to be necessary and the period of development depends somewhat on the abundance of the rain and on its continuance.

The fire disease of narcissus, J. Ritzema Bos (*Tijdschr. Plantenziekten, 7 (1901), No. 1, pp. 12–24*).—A description is given of a disease of narcissus caused by *Heterosporium gracile*, a fungus not hitherto recorded as attacking this host. Differences in susceptibility of varieties are shown, some being not attacked by the disease, while others seem especially subject to it. The disease causes the death of the leaves, which first become yellow, afterwards shrivel, dry up, and are covered with black masses of conidia. The disease usually causes the destruction of the leaves a month before the usual time, leaving the bulbs in a poorly ripened condition. It is claimed that many growers have found that the disease could be held in check by pulling out the flower stalks some time before the usual date of the appearance of the disease. If the flower stalks are merely cut off, the disease shows itself upon them. Investigations of the author show that the flower stalks are usually the first part attacked, and experiments with Bordeaux mixture showed conclusively that this disease in narcissus could be successfully prevented. An analysis is reported of the relative starch content in the bulbs in sprayed and unsprayed plants, where it was found that the sprayed plants contained 28 per cent more starch than a similar lot which had not been sprayed. Plats of equal size, sprayed and unsprayed, yielded 14 kg. of bulbs for the sprayed and 9 kg. for the unsprayed plats.—H. M. PIETERS.

Bordeaux mixture containing sugar, and bee culture, E. JACKY (*Ztschr. Pflanzenkrank., 11 (1901), No. 4-5, pp. 212-214*).—On account of the claim that the use of Bordeaux mixture containing sugar is injurious to bees, the author conducted a series of experiments, using Bordeaux mixture containing different amounts of sugar, both in crystallized form and as molasses, and numerous tests were made with different strengths of solution. Apple and other trees were sprayed with the solutions and careful watch kept to ascertain whether such trees were visited by bees or not. The results obtained were wholly negative, no bees being observed to visit the sprayed plants. The fungicide prepared in a similar manner was placed about the hives but the bees did not touch it, and when exposed on glass plates and dishes, both in liquid form and filter paper soaked in the mixture, similar results were obtained. The author concludes that the use of Bordeaux mixture to which sugar has been added to increase its adhesive property is not injurious to bees, as they seem to shun rather than seek such a mixture.

ENTOMOLOGY.

Department of entomology, A. B. CORDLEY (*Oregon Sta. Rpt. 1902, pp. 59-61; 64-66*).—In 1901 specimens of *Xyleborus dispar* were sent to the station with the statement that the insect was injuring small apple limbs. No further record was obtained until April, 1902. An examination of the orchard in which the insect occurred showed that injury was due only in a slight degree to the bark beetle. The trees were infested with a parasitic mushroom, apparently a species of Agaricus, and it is believed that the bark beetle had attacked the trees after they were already infested with the fungus.

Experiments were made in spraying Italian prune trees with fish oil and water in proportions varying from 5 to 25 per cent, and with California crude petroleum and water in the same proportion. After 48 hours it appeared that the leaves which had been sprayed with fish oil were injured where the drops had collected on the under surface. These areas died and fell out of the leaves. No injury was produced on the foliage, however, from the use of crude pretroleum, even when applied in a 25 per cent mixture. It appears, therefore, that California crude petroleum may be safely applied to Italian prune trees in the summer.

Report of the entomologist, R. C. SCHEIDT (*Pennsylvania Dept. Agr. Rpt. 1901, pt. 1, pp. 325-328*).—Notes are given on the prevalence, habits, and life history of the emperor moth, peach lecanium, forest tent caterpillar, oyster-shell bark louse, peach-twig borer, and San José scale. The usual remedies are recommended for these insects. In the destruction of the tent caterpillar, spraying with Paris green or kerosene emulsion was found very effective. It is stated that in wet weather large numbers of the tent caterpillars are destroyed by a bacterial disease.

Insects, J. M. Southwick (*Rhode Island State Bd. Agr. Rpt. 1901, pp. 94–111*).—Brief notes on the life history, habits, and means of combating imported elm-leaf beetle, tussock moth, ermine moth, fall webworm, *Estigmene acraea*, brown-tail moth, yellow-necked apple-tree caterpillar, cutworms, ants, and fish moths.

The importance of parasitic insects in agriculture, A. Berlese (*Bol. R. Scuola Superiore Agr. Portici, 2. ser., 1902, No. 4, pp. 27, figs. 12*).—Descriptive, biological, and economic notes are given on the common species of parasites which infest scale insects, lepidopterous caterpillars, and other insects. A brief account is given of predaceous and parasitic insects, and also on artificial insecticide treatments.

The present status of the Mexican cotton-boll weevil in the United States, W. D. Hunter (*U. S. Dept. Agr. Yearbook 1901, pp. 369–380, fig. 1*).—This insect was described in 1843, but first acquired importance as an injurious insect in the United States in 1894. Its distribution is at present confined to the State of Texas, where it occupies more than half of the cotton belt of that State. The State of Texas has appropriated considerable funds for making a study of suitable means of combating the weevil, and recently special provision has been made by Congress for this purpose. The insect is not killed by freezing in winter, and while several parasites of an insect and fungus nature are known to attack it, they are of little practical importance. The writer believes that the insect will migrate northward and will soon be outside the boundaries of Texas. The remedies most strongly recommended are cultural methods, the chief of which is early planting, the total destruction of plants in the field as soon as the gathering of the late crop becomes doubtful, and grazing of such green plants by cattle. Some importance should be attached to planting the rows as far apart as the soil will permit. Special machines have been devised for spraying the cotton plant, for jarring the insects or infected squares from the plants, and for picking up fallen squares from the ground.

Spraying tests for codling moth—New Zealand experience (*Jour. Agr. and Ind. South Australia, 5 (1902), No. 2, p. 904*).—Notes are given on the results obtained from spraying experiments by W. A. Boucher. The experiments included the use of Paris green in limewater; the same mixture with the addition of resin wash; a mixture containing white arsenic, washing soda, and limewater; and arsenate of lead. The last insecticide burned the foliage quite severely. Excellent results were obtained from the use of Paris green, 90 per cent of the fruit proving to be sound and uninfested with the codling moth.

Spraying orchards for the codling moth, F. Garcia (*New Mexico Sta. Bul. 41, pp. 26, pls. 3*).—The codling moth is becoming a serious pest in New Mexico. It was introduced into the Territory about 10 years ago and is now quite abundant in infested localities. Notes are given on the habits and life history of this insect and formulas are presented for preparing the usual arsenical sprays for application in destroying the codling moth. Experiments were made in spraying 5 varieties of winter apples. The trees were sprayed at intervals of 2, 3, and 4 weeks and some of the trees were banded and examined at intervals of 2 weeks, while the other trees were left without bands. The results of the authors' observations and experiments indicate that from 65 to 95 per cent of the apples on unsprayed winter trees are usually destroyed by the codling moth. A considerable number of worms were found under the bands in most cases and this remedy, therefore, appeared to be of some value. As a rule, the more frequent the spraying, the more effective was this treatment. It is believed that spraying in New Mexico will reduce the percentage of wormy apples very materially. Two early sprayings are not considered sufficient. Arsenite of soda is considered more satisfactory than Paris green. Early apples are quite free from worms while the second brood of codling moths is more injurious and destroys a larger percentage of late apples.

The apple-tree tent caterpillar, W. E. Britton (*Connecticut State Sta. Bul.*

139, pp. 12, pls. 3, figs. 3).—The apple-tree tent caterpillar was unusually abundant in Connecticut in 1902. Its common food supply is the wild cherry, but during the year it was noted on a considerable variety of trees. The author gives a description of the insect in its various stages, and notes on its habits, life history, and natural enemies. It is recommended that egg masses be destroyed in winter. The twigs on which the eggs are fastened may be readily detected and clipped off by means of a tree pruner with a long handle. A special wire brush has been devised for removing the nests from infested trees. Trees should be sprayed about the time the leaves appear, with a solution containing 3 lbs. arsenate of lead or ½ lb. of Paris green to 50 gal. of water. The author does not recommend the burning of the nests on the tree.

Some destructive caterpillars, E. D. SANDERSON (*Delaware Sta. Bul. 56, pp. 28, figs. 14*).—In this bulletin the author presents notes on the appearance, habits, life history, and means of combating fall webworm, white-marked tussock moth, and apple-tree tent caterpillar. The usual methods for controlling these insects are recommended. They include banding the trees, collecting the eggs, burning the nests of caterpillars, and spraying.

Coccidæ of Japan, S. I. KUWANA (*Contrib. Biol. Hopkins Seaside Lab. Leland Stanford Jr. Univ., 1902, No. 27; reprinted from Proc. California Acad. Sci., 3. ser., Zool., 3 (1902), No. 2, pp. 39–98, pls. 7*).—The author presents an account of the life history, habits, and distribution of a large number of Coccidæ from Japan, and a list of species recorded from Japan but not discussed in detail is also given.

Insecticide experiments for the San José scale (*Illinois Sta. Circ. 53, pp. 2*).—This circular contains a brief abstract of Bulletins 71 and 72 of the station (E. S. R. 14, p. 270).

The rose scale (Diaspis rosæ), J. B. SMITH (*New Jersey Stas. Bul. 159, pp. 14, figs. 6*).—This insect has been noted as injurious for a number of years. It causes most damage to the rose, blackberry, and raspberry. The winter may be passed in any stage. Twigs which were examined in December, in 1901, contained all stages except the active adult male. The larvæ are usually hatched by the beginning of March, and by the following November all stages are found on infested twigs. Breeding is apparently almost continuous after the beginning of the season, but there are probably not more than 3 broods per year. Detailed notes are given on the mouth parts of the insect, and on the manner in which it feeds. The insect seldom kills growing blackberry or raspberry canes, but its injuries may be serious on badly infested rose bushes. Infested shoots of blackberries or raspberries should be cut off as soon as the fruit is harvested. If infestation becomes serious during the summer, the plants may be sprayed with a weak solution of whale-oil soap or a 10 per cent mechanical mixture of kerosene or crude oil with water. Nearly all of the scales were killed by an application of 1 lb. whale-oil soap in 1 gal. of water, and no injury was caused to the canes by these applications. Similar methods of treatment, with slight variations, may be adopted in case of infested rose bushes. It is suggested that lime, salt, and sulphur mixture may prove very effective in controlling this insect.

Lime, sulphur, and salt wash for scale insects, C. P. LOUNSBURY (*Agr. Jour. Cape Good Hope, 20 (1902), No. 13, pp. 768–776*).—Brief notes are given on the origin and history of the use of this mixture in various English colonies and in the United States. It is stated that the lime, sulphur, and salt wash was first introduced into Cape Colony by P. J. Cillie in 1893, and has since been used with pronounced success in treating fruit trees and other plants for scale insects as well as fungus diseases. A number of experiments were conducted with this insecticide for the purpose of determining the necessary ingredients and their proper proportions in the preparation of the wash. It was found that the compounds of lime and sulphur are the effective agents in the wash. Spraying experiments with this insecticide indicated that, as noted by other investigators, the action of the wash may be extremely slow. Soon after its application it may appear that a large number of the scale insects have escaped destruction; they are gradually destroyed, however, during a period of a month or more. The scale insect against which this remedy was chiefly used was *Diaspis pentagona*.

Cyanid gas remedy for scale insects, C. P. Lounsbury (*Dept. Agr. Cape Good Hope, Pamphlet 11, 1901, pp. 27, pls. 2, figs. 11*).—In this pamphlet the author discusses the various materials which are required in making tents and transporting them from tree to tree. Notes are also given on the chemicals required for generating the gas, the method of mixing the chemicals, and the most satisfactory vessels to be used in these operations. The treatment of trees with hydrocyanic-acid gas is said to exterminate the red and brown scale by a single application, and in general to be the most effective remedy for the extermination of scales in orchards.

The spraying and cleaning of fruit trees, A. G. Campbell (*Jour. Dept. Agr. Victoria, 1* (*1902*), *No. 3, pp. 290–292*).—Brief notes are given on methods of combating codling moth, woolly aphis, plant lice on peaches, and leaf rust and leaf curl of peaches.

The grass thrips, L. R. Cary (*Maine Sta. Bul. 83, pp. 95–128, pls. 7*).—The life history, extraordinary appearance, and gross and microscopic anatomy of *Anophothrips striata* are described in detail. Notes are given on the habits of the insect. It attacks a number of common grasses, but is most injurious to June grass and timothy. It may be destroyed by spraying with kerosene emulsion or whale-oil soap, but these remedies can not be applied successfully on a large scale. Considerable help may be obtained from burning the ground over in the fall and thorough cultivation under a system of rotation.

Thrips on cocoa (*Bul. Bot. Dept. Jamaica, 9* (*1902*), *No. 5, pp. 70, 71, figs. 2*).—A species of thrips is reported as causing a discoloration of cocoa pods. It was a difficult matter to determine when the discolored pods became ripe, on account of the presence of the discoloration. The pods are attacked when about half grown. Little damage was done to the leaves, except where thrips were very abundant. A spray of kerosene emulsion is recommended for destroying this insect.

Means of combating Tortrix ambiguella, H. Grosjean (*Bul. Soc. Vaud. Agr. et Vit.* [*Lausanne*], *1902, No. 151, pp. 17–24*).—Notes are given on the various remedies which have been found most successful in combating this insect in its various stages.

Methods of combating Cleonus punctiventris, S. Skrzhinski (*Selsk. Khoz. i Lyesov., 204* (*1902*), *Feb., pp. 337–368*).—This beetle is said to be quite widely distributed, and is especially injurious to beets. A number of experiments were made for the purpose of determining the value of fungus diseases in combating the insect. The fungi used for this purpose were *Oospora destructor* and *Sorosporella agrotidis*. These fungi are said to occur spontaneously in fields infested with the beetles, and a certain number of beetles are annually destroyed by them. Experiments reported in this article indicate that satisfactory results may be obtained from distributing the fungi in infested fields so as to destroy the larvæ and pupa of the beetle while in the ground. It is estimated that not less than 1 lb. of the fungus material is required for each acre of ground upon which beets are raised in 5 or 6 year rotations. In some cases 2 or 3 lbs. per acre were required, while on ground where beets had never been raised it is recommended that 9 to 10 lbs. be used.—P. FIREMAN.

Botys sticticalis in the summer of 1901, V. P. Pospelov (*Izv. Moscow Selsk. Khoz. Inst.* [*Ann. Inst. Agron. Moscou*], *7* (*1901*), *No. 3–4, pp. 313–324*).—This species is found chiefly on the southern Russian steppes. It does not usually attack cultivated plants, but in 1901 was found on cabbage, cucumber, watermelon, canteloupes, and other garden and field crops. The methods recommended for combating it are fall or early spring plowing of infested soil, burning over the ground, and spraying with Paris green and lime.—P. FIREMAN.

A sawfly on turnips, Bouvier (*Rev. Gén. Agron.* [*Louvain*], *11* (*1902*), *No. 4, pp.*

210-212).—Brief notes are given on the habits and life history of *Athalia spinarum*, a sawfly which is reported as injurious to turnips in various parts of France. The species is usually of rare occurrence in France. A number of parasites of this species are known which help to check its undue multiplication.

Notes on a Phytoptus, A. Kempel (*Bol. Agr. São Paulo, 3. ser., 1902, No. 2, pp. 87-90, fig. 1*).—The author gives brief descriptive, biological, and economic notes of a species of mite injurious to fuchsias. The species is described as new under the name *Phytoptus fuchsiæ*. The mite is said to be quite susceptible to ordinary remedies which are used for similar pests.

Experimental work with fungus diseases of grasshoppers, L. O. Howard (*U. S. Dept. Agr. Yearbook 1901, pp. 459-470, figs. 3*).—Among the fungus diseases which have been used in combating grasshoppers, mention is made of *Empusa grylli*, a South African fungus belonging to the genus Mucor, and a species of Sporotrichum from Argentina. While persistent efforts have been put forth in various countries and in various States of this country in spreading disease among grasshoppers, it is held by the writer that "the results obtained so far do not justify very sanguine hopes." L. Bruner, who experimented with fungus diseases of grasshoppers in the Western States, believes that the importance of this remedy has been much exaggerated, and that little is to be hoped from the use of fungus diseases. Some apparently good results, however, have been obtained, and notes are given on a number of these cases in the article.

Lantern traps, P. Coste-Floret (*Prog. Agr. et Vit.* (*Éd. L'Est*), *23* (*1902*), *No. 28, pp. 38-44, figs. 6*).—Notes are given on the success obtained from the use of various kinds of lantern traps, using different substances for illumination.

Spraying for city and country, A. H. Kirkland (*Rhode Island State Bd. Agr. Rpt. 1901, pp. 202-217, pls. 2*).—Brief notes on formulas for the preparation of Paris green, arsenate of lead, kerosene emulsion, and Bordeaux mixture, together with an account of apparatus desirable for ordinary spraying operations and directions as to time and method of spraying apple, pear, stone fruits, small fruits, vegetables, flowers, and shade trees. A special discussion is given on San José scale and gypsy moth.

Directions and formulas for spraying, A. V. Stubenrauch and J. W. Lloyd (*Illinois Sta. Circ. 39, pp. 11*).—A discussion is presented on the following subjects: Pure materials for spraying, proper proportion of mixtures, proper method of application, and time of application. Formulas are given for the preparation of the more important insecticides and fungicides.

Spraying calendar, L. R. Taft (*Michigan Sta. Spec. Bul. 15, folio*).—Suggestions are presented in a tabular form regarding the treatment to be applied to some of the more important economic plants in case of the attack of insect or fungus enemies. Formulas are also given for the preparation of Bordeaux mixture, copper sulphate solution, potassium sulphid, Paris green, white arsenic, hellebore, pyrethrum, kerosene (in emulsion or mechanical mixture with water), and whale-oil soap.

The white ant (Termes flavipes), C. L. Marlatt (*U. S. Dept. Agr., Division of Entomology Circ. 50, 2. ser., pp. 8, figs. 4*).—A revised reprint from Division of Entomology Bulletin 4, new series (E. S. R., 9, pp. 62-66).

Cockroaches, C. L. Marlatt (*U. S. Dept. Agr. Division of Entomology Circ. 51, 2. ser., pp. 15, figs. 5*).—A revised reprint from Division of Entomology Bulletin 4, new series (E. S. R., 9, pp. 62-66).

The bedbug (Cimex lectularius), C. L. Marlatt (*U. S. Dept. Agr., Division of Entomology Circ. 47, 2. ser., pp. 8, figs. 3*).—A revised reprint from Division of Entomology Bulletin 4, new series (E. S. R., 9, pp. 62-66).

The house centipede (Scutigera forceps), C. L. Marlatt (*U. S. Dept. Agr., Division of Entomology Circ. 48, 2. ser., pp. 4, figs. 2*).—A reprint from an earlier publication (E. S. R., 9, p. 63).

The silver fish (Lepisma saccharina), C. L. Marlatt (*U. S. Dept. Agr., Divi-*

sion of Entomology Circ. 49, 2. ser., pp. 4, figs. 2).—A revised reprint from Division of Entomology Bulletin 4, new series (E. S. R., 9, pp. 62–66).

Hydrocyanic-acid gas against household insects, L. O. Howard (*U. S. Dept. Agr., Division of Entomology Circ. 46, 2. ser., pp. 4*).—The author reviews the recent literature on the various uses to which this remedy has been applied. Hydrocyanic-acid gas has been used successfully in destroying insects in houses, granaries, greenhouses, and stores, as well as on living trees and other plants. Attention is called to the great danger from inhaling the fumes of the gas.

Some mosquitoes of Mississippi, and how to deal with them, G. W. Herrick (*Mississippi Sta. Bul. 74, pp. 31, figs. 15*).—The author gives a popular account of the relation of mosquitoes to malaria and yellow fever. The most common species in the State is *Culex pipiens.* Detailed notes are given on the life history and habits of this species. Two species of malarial mosquitoes are reported from Mississippi, viz: *Anopheles punctipennis* and *A. maculipennis.* Notes are given on the breeding habits and life history of the first-named species. The duration of the immature stages of this mosquito, under normal conditions, in Mississippi was found to be 16 to 18 days, of which the egg stage occupied 2, the larval stage 12, and the pupal stage 2 days. The yellow fever mosquito (*Stegomyia fasciata*) is commonly known as the "day mosquito" in Mississippi, and is reported as being common throughout the State. A number of other species are reported, including *Culex pungens, C. tarsalis, C. confinis, C. consobrinus, Psorophora ciliata,* and *Conchyliastes musicus.* Notes are given on the various breeding places of mosquitoes and on the number that may be produced from small vessels containing water. As remedies for mosquito plagues the author recommends drainage, stocking water with fish, and the use of kerosene oil. In small open drains with a moderately rapid current it was found that pouring oil on the water was not successful, since the oil did not reach the sides of the ditch. Better results were obtained by spraying oil upon the water, and it was found that by this method many adult mosquitoes, which were resting on the grass and weeds were destroyed. It is recommended that an application of oil be made at least twice per month in order to be effective in destroying the mosquitoes. An observation is reported from which it appears that flooding drains can not be depended upon to carry away the mosquito larvæ.

The mosquito plague in the City of Mexico in 1901, A. L. Herrera (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 16 (1901), No. 5–6, pp. 207–228*).—The author gives a general account of the mosquito plague of 1901, with notes on the methods which were adopted for destroying the mosquitoes, and the cost of such work. Special attention was given to locating the breeding places of the mosquitoes and destroying them in such locations by drainage or the application of kerosene. The species chiefly concerned was *Culex pungens.* It is believed that all of the mosquitoes in the City of Mexico could be destroyed by draining away stagnant water in the vicinity of the city, and using kerosene upon the small pools.

Some parasites of mosquitoes, A. Laveran (*Compt. Rend. Soc. Biol. Paris, 54 (1902), No. 8, pp. 233–235*).—The author reports the finding of a number of parasites in mosquitoes, including *Tyroglyphus siro, Cheyletus eruditus,* and a number of undetermined species of mites, as well as micro-organisms of a bacterial nature.

The sting of certain Hemiptera, R. Blanchard (*Arch. Parasit., 5 (1902), No. 1, pp. 139–148*).—Notes are given on the appearance, habits and life history of a number of Hemiptera which may cause more or less serious consequences by puncturing the skin of man and domesticated animals. The species to which most attention is given are *Lyctocoris campestris, Reduvius personatus,* and *Conorrhinus sanguisuga.*

Fowl tick, A. A. Brown (*Jour. Agr. Victoria, 1 (1902), No. 1, pp. 86–90, figs. 7*).—Notes are given on the appearance, habits and life history of *Argas americanus.* In combating these pests the author found that kerosene alone was not an effective remedy but that better results were obtained by the use of kerosene and soap emulsion. An effective dip was found in a solution of 40 per cent formalin in the proportion of 1 part to 250 parts of water. It is recommended that on badly infested premises, old wooden henhouses be pulled down and corrugated iron buildings be erected in their place.

Bee culture, C. C. Miller (*Pennsylvania Dept. Agr. Rpt. 1901, pt. 1, pp. 334–427, figs. 14*).—This article constitutes a general treatise of a practical nature covering all of the subjects ordinarily included under apiculture. Among the various subjects treated in the article, mention may be made of fertilization of flowers by bees, locations for colonies, kinds of honey, honeycomb, hives, different varieties of bees, apparatus for use in managing bees, artificial feeding, comb foundation, clipping queens, extracting honey, prevention of swarming, rearing of queens, division of swarms, enemies and diseases of bees, care in winter, and a brief discussion of the more important literature relating to bees.

Practical bee keeping, A. E. Manum (*Rhode Island State Bd. Agr. Rpt. 1901, pp. 218–231*).—Brief notes are given on the selection of hives and frames, as well as on the spring management, preparation for summer harvest, spring dwindling, stimulative feeding, and notes on wintering and putting on section boxes.

Long-tongued bees, A. Gale (*Agr. Gaz. New South Wales, 13 (1902), No. 2, pp. 233–235*).—The author presents a brief digest of the literature on the subject of breeding bees so as to secure an elongation of the tongue. This subject is considered of some importance for New South Wales on account of the fact that heretofore it has been found impossible to introduce bumblebees for the purpose of fertilizing red clover. The possibility of securing a honeybee with a tongue of sufficient length to obtain honey from these flowers is worth considering for the reason that such honeybees would be induced to visit the red clover and thus fertilize it.

The embryology of the silkworm, K. Toyama (*Bul. Col. Agr. Imp. Univ. Tokyo, 5 (1902), No. 1, pp. 73–118, pls. 5, fig. 1*).—The author discusses the literature relating to the early developmental stages of the silkworm, in connection with an extensive bibliography. The discussion is confined largely to a description of the early stages of development, with special regard to indicating the origin of the various embryonic organs of silkworms.

Healthy and diseased silkworms, S. Egidio (*Staz. Sper. Agr. Ital., 35 (1902), No. 1, pp. 35–45*).—The author made a careful analysis of the excrement and contents of the alimentary tract of healthy and diseased silkworms, in order to determine whether the presence of uric acid or urea should be considered as indicating a diseased condition. It was found that in the excrement of healthy silkworms no uric acid, hippuric acid, or urea was to be found.

FOODS—NUTRITION.

Cereal breakfast foods, L. H. Merrill and E. R. Mansfield (*Maine Sta. Bul. 84, pp. 129–152*).—Continuing the investigations reported in an earlier bulletin (E. S. R., 12, p. 69), the authors studied the composition and nutritive value in proportion to the cost of a number of cereal breakfast foods. In the case of malted cereal goods and some others the methods of manufacture are briefly discussed. The average percentage composition of the corn, oat, and wheat breakfast foods, which constitute the larger proportion of the foods examined, follows:

Average composition of corn, oat, and wheat breakfast foods.

	Water.	Protein.	Fat.	Crude fiber.	Nitrogen-free extract.	Ash.	Heat of combustion per pound.	Average price per pound.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*	*Cents.*
Corn foods	10.2	8.7	0.6	0.3	79.9	0.3	1,750	5.7
Oat foods	8.4	16.0	7.2	.9	65.6	1.9	1,950	6.0
Wheat foods	9.0	12.4	1.9	1.3	73.9	1.5	1,800	[a]10.6

[a] Omitting 4 extreme cases.

According to the authors "All the cereal foods examined were good articles and the average prices as a rule are not exorbitant. On the contrary, when compared with the meats and vegetables, the most of them must be classed as very economical foods. The prices are exceedingly variable and, so far as ordinary chemical analysis shows, furnish no measure of the value of the goods. On the other hand, while their comparative digestibility has not yet been well worked out, there can be no doubt that the attempts to increase the digestibility of some of these goods by special treatment has been successful and persons of weak digestion would find it to their advantage to base their selection upon other data than that here given. Fortunately the invalids are still in the minority, and the average consumer, who will experience difficulty with any of these foods, is not justified in paying 20 cts. per pound for a cereal preparation when another, that will serve his purpose exactly as well, can be had at 5 or 6 cts."

The relative cost of home cooked and purchased food (*Massachusetts Labor Bul., 1901, No. 19, pp. 67–98*).—The committee on domestic service of the Boston branch of the Association of Collegiate Alumnæ studied the possibility of providing an acceptable diet from foods cooked out of the house, and the comparative cost of the same foods if cooked at home. Two tests were made, one of 3 and one of 6 days, as well as a study of the time required and the comparative cost of preparing food when coal, gas, and oil were used as sources of heat. The latter study also covered 6 days. It was found: "(1) That a well-varied menu of good quality could be provided for a large family from food prepared outside the house; (2) that the expense was greater when the food was bought outside; and (3) that there was a great saving in time and labor by the purchase of food outside." In the first test the average cost per person per meal, including fuel and labor, when the food was cooked outside the house was 25.569 cts.; when the same food was prepared at home the average cost was 16.485 cts. In the second test the corresponding values were 19.533 cts. and 15 cts. "The saving in time by the purchase of the food ready cooked was very great. In the first experiment 4½ hours were required to prepare the cooked food for the table. It took 32½ hours to cook the same food in the house. In the second experiment the difference was also very marked. The time needed for preparing the food cooked outside was 11 hours, while it took 41½ hours for the home-cooked articles." The fact was recognized that it would only be possible to provide a satisfactory menu with ready-cooked foods in large towns offering the necessary market facilities.

The nutritive value of hens' eggs, G. Lebbin (*Therap. Monatsh., 15 (1902), pp. 552, 553; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 14, p. 664*).—A digestion experiment is reported, in which a healthy man consumed 22 eggs in 2 days. Especial interest attaches to the fact that the lecithin and neutral fat were determined. The coefficients of digestibility obtained follow: Dry matter 95.01, protein 97.59, total ether extract 95.77, lecithin 91.03, neutral fat 98.00, and ash 70.38 per cent.

The composition and nutritive value of biltong, W. D. Halliburton (*British Med. Jour., 1902, No. 2154, pp. 880–882*).—The author reports an analysis and artificial digestion experiments. Biltong, which is the sun-dried flesh of the springbok, is prepared in considerable amounts in South Africa and will keep in good condition for a long time. When used as food the hard strips are usually scraped or grated. According to the author this material has the following percentage composition: Water 19.4, protein 65.9, fat 5.1, glycogen 0.1, sugar 0.1, extractives (by difference) 2.8, and ash 6.6. As shown by the artificial digestion experiments, biltong was somewhat less soluble than dried fibrin, or dried rabbit muscle. It was, however, according to the author, quite thoroughly digested.

Effect of preserving meat by covering it with different salts, P. Kuschel (*Arch. Hyg., 43 (1902), No. 2, pp. 134–150*).—Experimental data are reported.

The estimation of the fat content of wheat bread, and the possibility of determining whether bread is made with milk or water, or whether it con-

tains added fat, J. C. Berntrop (*Ztschr. Angew. Chem., 15 (1902), No. 6, pp. 121–125, figs. 2*).—The author notes that according to earlier investigators, all the fat present in materials from which bread is made is not recovered in the baked products. He reports a method of estimating fat, which it is claimed gives more satisfactory results than the usual method, and shows that all the fat may be recovered. The method advocated is as follows: 150 gm. fresh bread (or more if desired) with 500 cc. water and 100 cc. strong hydrochloric acid is placed in a suitable flask connected with an inverted condenser and heated over a free flame for 2 hours. After cooling, the brown liquid which contains the undissolved cellulose and fat is filtered, the residue washed with cold water until an acid reaction is no longer observed, dried for an hour at 100 to 110° C, and ground in a mortar with a little ignited sand. The pulverized material and the filter paper from which it was removed are together extracted with petroleum ether, ether or carbon tetra-chlorid in an extraction apparatus of special construction, which is described. In a test reported, the flour and milk from which bread was made together contained 4.93 gm. fat. The author obtained from dough 4.95 gm. and from bread baked from the same quantities 4.92 gm. fat. A sample of bread made from flour and water contained theoretically 1.64 per cent fat. The author found 1.60 per cent fat in the bread, the results being in both cases calculated on the dry matter basis. Other tests are reported. According to the author, the determination of the Reichert-Meissl number of the bread fat furnishes a means of determining whether the bread was made from water, whole milk, or skim milk, and also whether it contained added fat other than milk fat.

Commercial wheat and maize starch, O. Saare (*Ztschr. Spiritusind., 24 (1901), pp. 502, 512, 513; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 8, p. 364–366*).—The chemical composition of a number of samples of wheat and maize starch is reported.

The composition of hard wheats and the constitution of hard-wheat gluten, E. Fleurent (*Compt. Rend. Acad. Sci. Paris, 133 (1901), pp. 944–947; abs. in Chem. Centbl., 1902, I, No. 3, p. 214*).—Samples of hard wheat from Russia, Africa, and Canada were examined.

Banana meal, H. H. Cousins (*Jour. Jamaica Agr. Soc., 6 (1902), No. 7, p. 268*).—An analysis of banana meal, or flour, is reported.

Banana flour (*Rev. Hort. [Paris], 74 (1902), No. 15, p. 353*).—An analysis of banana flour is quoted and its nutritive value briefly discussed.

Cassava, E. Leuscher (*Ztschr. Oeffentl. Chem., 8 (1902), pp. 10–11; Chem. Centbl., 1902, I, No. 8, p. 493; abs. in Jour. Soc. Chem. Ind., 21 (1902), No. 7, p. 492*).—Cassava flour and other cassava products are described and discussed.

Composition and nutritive value of certain Colonial vegetables, A. de Villèle (*Rev. Agr. Réunion, 8 (1902), No. 1, pp. 16–23*).—The composition of a number of vegetable products is reported, including black night shade (*Solanum nigrum*) chayote (*Sechium edule*), taro (*Colocasia esculenta*), squash (*Cucurbita pepo*), sea blight (*Amarantus blitum*), Chinese mustard (*Sinapis sinensis*), moringa (*Moringa pterygosperma*), and 2 species of cabbage palm (*Areca crinica* and *A. alba*).

Some unusual food plants, Julia D. Chandler (*Amer. Kitchen Mag., 17 (1902), Nos. 2, pp. 59–62; 3, pp. 99–102*).—Many unusual foods of vegetable origin are described and discussed.

On Hamana-natto, a kind of vegetable cheese, S. Sawa (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1902), pp. 419, 420*).—The composition of Hamana-natto, a sort of vegetable cheese made from soy beans, is reported, as well as data obtained in a bacteriological examination of the product.

Concerning the Japanese nori, K. Oshima and B. Tollens (*Ber. Deut. Chem. Gesell., 34 (1901), pp. 1422–1424; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 8, p. 369*).—A chemical examination of nori (*Porphyra laciniata*), one of the marine algæ used as food in Japan, is reported.

The composition of food from horse chestnuts (Æsculus hippocastanum), E. Laves (*Pharm. Centralhalle, 42 (1901), pp. 333–336; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 8, p. 369*).—The composition is reported of horse chestnuts after extraction with alcohol.

Chemistry of confectioners' materials and processes, W. Jago (*Jour. Soc. Arts, 50 (1901), No. 2562, pp. 93–101; 50 (1902), Nos. 2563, pp. 106–115; 2564, pp. 118–128; 2565, pp. 134–142*).—In these lectures, which were delivered before the Society of Arts, the chemistry of the materials employed by confectioners is discussed, as well as the chemistry of the changes such materials undergo in cooking and related topics.

Sugar in the diet of man, L. Grandeau (*Rev. Gén. Agron. [Louvain], 11 (1902), No. 6, pp. 316–322*).—In an article quoted from *Bul. Assoc. Chim. Sucr. et Distill.* the value of sugar as a source of energy is discussed.

Diet in relation to age and activity, Sir Henry Thompson (*London and New York: Frederick Warne & Co., 1902, pp. 134, pl. 1*).—The first part of this volume is a reprint of the author's earlier work on the subject; the second part contains a detailed discussion of the diet suited to persons of advanced age. The author believes that in a large measure each person must learn by careful observation the diet which is suited to his individual needs, but in all cases recommends extreme moderation. He believes that simple foods are most desirable for the aged and that animal food should be eaten in great moderation, fish, poultry, and game being preferable to meats.

Dietaries in public institutions, W. O. Atwater (*U. S. Dept. Agr. Yearbook 1901, pp. 393–408*).—The general problem of feeding large groups of persons under more or less uniform conditions is discussed and results of the author's dietary investigations in the New York State hospitals for the insane are quoted.

The physiology of nutrition, H. P. Armsby (*Agr. Education, 4 (1901), No. 2, pp. 33–35*).—A general discussion.

Food and energy, H. P. Armsby (*Pennsylvania State Dept. Agr. Rpt. 1901, pt. 1, pp. 670–679*).—A discussion of nutrition from the standpoint of thermo dynamics.

Theory and practice of infant feeding, with notes on development, H. D. Chapin (*New York: William Wood & Co., 1902, pp. XII + 326, figs. 97*).—The food requirements of infants are discussed, as well as the characteristics of milk and other feeding stuffs suited to infants, methods of feeding, and related topics. The author states that special attention is devoted to the discussion of milk in relation to its influence on the development of the digestive tract of the young animal. In discussions of milk American authorities have been cited, as the author designs his work especially for American readers. It is worthy of note that the author has made extended use of the investigations and publications of the U. S. Department of Agriculture and the agricultural experiment stations.

The feeding of infants, J. E. Winters (*New York: E. P. Dutton & Co., 1901, pp. VIII + 47*).—The food requirements of infants is discussed and directions given for modifying milk at home.

Concerning temperature regulation in newborn infants, E. Babák (*Arch. Physiol. [Pflüger], 89 (1902), No. 3–4, pp. 154–177*).—Experiments are reported in which calorimetric measurements and determinations of the respiratory quotient were made. A bibliography is included.

Second annual report of the State Food Commissioner of Illinois (*Illinois State Food Com. Rpt. 1901, pp. 258, figs. 8*).—In addition to the usual legal and statistical matter, the author reports analyses ot a number of samples of cocoa and cocoa products, milk, honey, sirup, jams, jellies, vinegar, etc.

Sixteenth annual report of the Ohio Dairy and Food Commissioner (*Ohio State Dairy and Food Com. Rpt. 1901, pp. 129*).—This volume contains the usual legal and statistical matter.

ANIMAL PRODUCTION.

Concentrated feeding stuffs, L. A. VOORHEES and J. P. STREET (*New Jersey Stas. Bul. 160, pp. 79, figs. 3*).—In accordance with the provisions of the State Feeding Stuffs Law, a large number of samples of feeding stuffs were analyzed, including cotton-seed meal, linseed meal, cocoanut cake, germ-oil meal, gluten meal, gluten feeds, hominy meal, and similar corn breakfast food by-products, corn bran (or sugar feed), malt sprouts, dried brewers' grains, dried distillers' grains, mixed feeds (including cereal breakfast food by-products), rice meal, calf meal, ground meat, poultry feeds, wheat bran (from winter, spring, and unclassified wheat), wheat feed, wheat middlings, brown middlings, feeding flour, buckwheat bran, buckwheat feed, rye bran, rye middlings, rye feed, barley feed, corn meal, cob meal, ground corn and oats, and other mixed ground grains, flaxseed meal, wheat bran and oil, sugar-beet pulp, and nutrium milk powder.

"Of the 287 samples which were guaranteed and of which an examination was made, 76 failed in their promises, 60 of these being deficient in protein. Among the 249 samples of feeds not required to be guaranteed, 14 were found to be contaminated or adulterated with foreign matter, principally offal of milling.

"There are on the feed market a considerable number of very inferior feeds, which consist of oat hulls, rice hulls, coffee hulls, etc., which can not form a profitable purchase at any price. In buying feeds to supplement his home-grown supply, the dairyman's aim should be to secure digestible and palatable protein on the most reasonable terms and in the most economical forms. Fully half of the different and distinct brands of feeds [analyzed] do not meet his requirements in this respect."

Descriptions are given of rice hulls and coffee hulls, which the authors state are new adulterants in the feeding stuffs sold in New Jersey.

The losses in the fat of corn meal due to the action of molds were studied. On the basis of a large number of analyses the fat in normal corn meal was found to average in amount 47 per cent as much as the protein. Samples which showed under the microscope the presence of *Penicilium glaucum* had lost from 4.2 to 67.7 per cent of the fat which should have been present if the meals were originally of normal quality. To determine whether the growth of mold was the real cause of the diminished fat content, samples of normal corn meal of known composition were inoculated with *P. glaucum* and the mold allowed to grow for 9 days at an average of 71° F. under different conditions as regards moisture. The percentage loss of fat was found to range from 1.85 to 12.24, the smallest loss being found in the sample in which there was 10.73 per cent of water present and the greatest in the sample having the largest amount of water, viz, 36.24 per cent. In other words, the percentage loss of fat increases with the amount of moisture present. Other tests are very briefly reported, which bear out this opinion.

The composition of the commercial feeding stuffs sold in Connecticut, E. H. JENKINS ET AL (*Connecticut State Sta. Rpt. 1901, pt. 4, pp. 313–349*).—During the year 1901 a number of feeding stuffs were analyzed, in accordance with the provisions of the State law. These included cotton-seed meal, linseed meal (old and new process), bran, middlings, mixed wheat feeds, corn meal, gluten meal, gluten feeds, hominy feeds, rye feed, malt sprouts, buckwheat shucks, buckwheat middlings, commercial and proprietary feeds (including cereal breakfast food by-products), animal meal, beef scrap (and similar poultry feeds), and several condimental and medicinal feeds. A table showing the weight per quart of a number of commercial feeds is also given.

Analysis of feed stuffs sold in Maryland, H. B. MCDONNELL (*Maryland Agr. Col. Quart., 1902, No. 16, pp. 7*).—Analyses are reported of samples of cotton-seed meal, linseed meal, gluten meal and feed, germ-oil meal, malt sprouts, dried brewer's grains, wheat middlings, wheat bran, ground oats, corn meal, meat-and-bone meal, and meat scrap.

Modern cattle foods and cattle-food controls, W. Frear (*Pennsylvania State Dept. Agr. Rpt. 1901, pt. 1, pp. 684–689*).—The benefits of regulating the sale of feeding stuffs are discussed, as well as some of the laws on the subject which have been enacted in this country and Europe.

Forage from Russian thistles (*Kansas State Bd. Agr. Quar. Rpt. 1902, June, pp. 5–23*).—Feeding Russian thistles, green and cured, methods of curing and related topics are discussed on the basis of information received in answer to inquires made by the State board of agriculture. The general conclusion is drawn that while Russian thistles, both fresh and cured, constitute a fairly satisfactory feed, their growth should not be encouraged, since they are in other respects troublesome weeds.

Nutritive value of the Russian thistle, E. H. S. Bailey and C. F. Gustafson (*Kansas State Bd. Agr. Quar. Rpt. 1902, June, pp. 24–27*).—Analyses are reported of green and cured Russian thistles, the data serving as a basis for a discussion of the nutritive value of this plant.

Cattle food from sugar cane in the West Indies, G. Sawter (*U. S. Consular Rpts., 69 (1902), No. 263, p. 562*).—A brief note on a cattle feed called "molascuit," made from molasses and bagasse.

Corn as a stock food, H. J. Waters (*Missouri State Bd. Agr. Rpt. 1902, pp. 142–181, pls. 3, fig. 1*).—The feeding value of corn and corn products is discussed, the results of numerous investigations carried on at the experiment stations in different States being cited.

Fenugreek a stock food (*Farm Students' Rev., 7 (1902), No. 2, p. 21*).—The feeding value of fenugreek, which is an ingredient of many condimental feeds, is briefly discussed.

Intensive feeding of farm animals with fenugreek seed, Schlagdenhauffen and Reeb (*Bul. Agr. Algérie et Tunisie, 8 (1902), No 9, pp. 225–227*). —Abstracted from another publication (see below).

Fenugreek, its influence on general nutrition, E. Reeb (*Monatsber. Gesell. Förd. Wiss. Ackerb. u. Künste, Unter-Elsass, 36 (1902), No. 2, pp. 62–64*).—The author notes the favorable effects which follow the feeding of fenugreek and attributes them to the lecithin found in the oil. The percentage of this constituent is rather high, being, according to the author, 1.51 per cent.

Concerning the depression digestibility of fodder when an excessive amount of carbohydrates is fed, E. A. Bogdanov (*Izv. Moscow Selsk. Khoz. Inst. [Ann. Inst. Agron. Moscou], 7 (1902), No. 3–4, pp. 139–156*).—From an extended review of the literature the author concludes that the lowering of the coefficient of digestibility observed when carbohydrates are added to a ration is sometimes real and sometimes apparent; being due in the one case to increased undigested residue, and in the other to increased metabolic products in the feces.—P. FIREMAN.

Comparison of silage and shock corn for wintering calves intended for beef production, H. W. Mumford (*Illinois Sta. Bul. 73, pp. 269–282, figs. 4*).—With 2 lots, each containing 25 grade steers 8 months old, the relative merits of corn silage and shock corn were tested, these materials being fed ad libitum in addition to an average daily ration of 2 lbs. of oats and 4.55 lbs. mixed hay in the case of corn silage, and 2 lbs. of oats and 4 lbs. of mixed hay in the case of the shock corn. The average amount of corn silage eaten per head daily was 26 lbs., the average amount of shock corn 13.22 lbs. It was the author's purpose to feed the calves a maintenance ration during the winter of such a character that they would be in satisfactory condition for subsequent fattening. During the 88 days of the test the average daily gain per head of the lot on silage was 1.68 and on shock corn 1.42 lbs., the dry matter required per pound of gain being 6.52 and 8.57 lbs. respectively.

Ten pigs followed the steers fed shock corn for 70 days, gaining on an average 6.8

lbs. per day; the number was then increased to 15 pigs, until the close of the test. The average daily gain of the lot was now found to be only 4.9 lbs., showing that the number of pigs was too large. At first 10 pigs followed the steers fed corn silage. They did not make satisfactory gains except when corn was fed in addition to the feed which they gathered. The number was finally diminished until only 1 was left. The author believes that without additional feeding 1 or possibly 2 pigs might have secured feed enough to make good gains, and calculates that during the test the total gains made by the pigs following the lot fed silage was 87 lbs.

The author's principal conclusions were as follows:

In the feeding of 5.33 acres of silage to calves 8.69 acres of crops other than corn were used. In the feeding of 5.33 acres of shock corn to calves 5.68 acres of crops other than corn were used. This difference may or may not be found unavoidable. It requires a third longer time to feed an acre of corn silage than an acre of shock corn.

So far as the cost of harvesting and feeding crops for the production of beef is concerned, in the net profits of the enterprise, it should be borne in mind that it will probably require nearly twice as great an expenditure of labor and capital in a system of silage feeding as in a system of shock corn feeding. The silage-fed steers were in much better thrift and flesh at the end of the experiment than were the shock-corn-fed steers. In case of the silage-fed steers 97.69 per cent of the meat produced was beef and 2.31 per cent pork. In case of the shock-corn-fed steers 84.22 per cent of the meat produced was beef and 15.78 per cent was pork. This clearly shows that pork production is an important factor in a system of feeding shock corn for beef production, while it may be entirely eliminated from a system of silage feeding for beef production practically without loss.

"Under conditions comparable with those prevailing in this experiment one steer would be able to make an average daily gain of 1.68 lbs., for a period of 6 months on . . . 0.31 of an acre . . . devoted to corn for silage, 0.23 of an acre to oats, and 0.28 of an acre to hay. One steer receiving shock corn, oats, and hay would be able to make an average daily gain of 1.42 lbs. for a period of 6 months on . . . 0.45 of an acre devoted to growing the corn, 0.23 of an acre to oats, and 0.24 of an acre to hay, making a difference of 0.26 of a pound of meat per day per steer and 0.1 acre of land for the season, both being in favor of the steers receiving their corn in the form of silage for the period designated."

Factors in beef production, F. B. Mumford (*Missouri Sta. Circ. of Information 12, pp. 22, figs. 5*).—A general discussion reprinted from the Missouri State Board of Agriculture Bulletin, 1902, April.

Characteristics of the prime steer, H. W. Mumford (*Illinois Sta. Circ. 38, pp. 3*).—Under the headings of form and quality the author discusses the characteristics of first-class beef steers.

The characteristics of stockers and feeders, H. W. Mumford (*Illinois Sta. Circ. 48, pp. 4*).—The author enumerates the points which characterize steers designed for feeding for beef of prime quality.

A scale of points as a means of judging cattle, and the standard of the race found in Limoneuse, A. Lonay (*Bul. Cercle d'Études Agron.* [*Brussels*], *1902, No. 4, pp. 105–125*).—The author discusses judging cattle with special reference to local conditions

Sheep feeding on the range; lamb feeding—second trial, F. E. Emery (*Wyoming Sta. Bul. 51, pp. 19–40, pls. 2, figs. 6*).—In studying the possibility of profitably fattening cull sheep on the range in preference to selling them at a low price, a test is reported which included at the beginning 2,843 ewes having broken teeth or spoiled udders, averaging at least 7 years, and 500 wethers 2 years old culled from a flock of over 9,000. It is stated that these sheep would not have sold for over $1, or at most $1.25 per head. All the sheep were fed for 80 days on an average of 1.01 lbs.

corn and 0.2 lb. oats per head daily. A few were sold to local butchers, but the greater number were sold in eastern markets, the total sum received being equivalent to $1.49 per head. This test, according to the author, indicates that it is more profitable to fatten such sheep than to sell them for a low price.

Continuing earlier work (E. S. R., 13, p. 582), the author tested the comparative merits of native hay and alfalfa hay in addition to corn, with 2 lots each containing 50 lambs. At the beginning of the trial the average weight of the lambs fed native hay was 46.2 lbs., and of those fed alfalfa hay, 45.3 lbs. The test covered 70 days. During that period the average daily gain per head was 0.221 lb. for the lot on native hay, and 0.343 for the lot on alfalfa hay. Following this period all the lambs were fed alfalfa hay with corn, and were sold for slaughtering in lots of 25, the last lot being sold some 5 months after the beginning of the trial. The average daily gain per head was 0.186 lb. The total cost of feeding the lambs was estimated at $4.23 per head; they were sold for 5.21 cts. per pound. The author states in effect that up to the conclusion of the comparative feeding of alfalfa and native hay there was a profit, the high price for feed being balanced by the high price the lambs were then worth. But at the end of the test, although the lambs continued to make good substantial gains, there was a heavy loss, aggregating nearly three times the profit up to the end of the comparative period.

Breeding experiments with sheep, F. B. Mumford (*Missouri Sta. Bul. 53, pp. 167–188, figs. 7*).—Cross-bred ewes were bred to registered Hampshire, Shropshire, and Delaine Merino rams, and records kept of the weight of the lambs, etc. The principal conclusions follow: The birth weight of lambs is largely or entirely controlled by the mother, those weighing most at birth being from the heaviest ewes. Apparently the birth weight of the lambs and the weight of the ewes are closely related and vary together. Neither the breed nor the size of the rams used were determining factors in fixing the birth weight of the lambs, which was found on an average to be 7.7 lbs. At birth the male lambs were 16 per cent heavier than the female lambs, the former averaging 8.10 lbs. and the latter 6.98 lbs. The average birth weight of twin lambs was only 0.5 lb. below the general average. For an average period of 7 weeks after birth the male lambs gained 4.01 lbs. per week and the female lambs 3.97 lbs. Lambs having the heaviest weight at birth made the largest weekly gains during the 7 weeks covered by the author's observations. Those weighing 10 lbs. and over at birth gained on an average 4.5 lbs.; those weighing below 7 lbs. at birth, 1.7 lbs. The average milk yield of ewes is recorded as well as their feed requirements. Lambs fed cows' milk from a bottle in 11 weeks gained on an average 3.09 lbs. per week; those fed ewes' milk from a bottle, 4.11 lbs.; and those nursing their dams, 3.7 lbs. According to the author the lambs receiving ewes' milk developed a fleece with a more abundant yolk and of a more uniform color than the lambs fed cows' milk, while the oiliness of the fleece of the lambs fed ewes' milk was also thought to increase more rapidly.

Mohair and mohair manufactures, G. F. Thompson (*U. S. Dept. Agr. Yearbook 1901, pp. 271–284, pls. 2, fig. 1*).—Suggestions for improving Angora goats as mohair producers are given, as well as descriptions of some of the manufatured mohair fabrics. The use of the skin for rugs, etc., is also noted.

Horse feeding, L. A. Merrill (*Utah Sta. Bul. 77, pp. 129–164, figs. 9*).—In addition to reviewing briefly the previous work on horse feeding at the station (E. S. R., 6, p. 751), a number of experiments are reported on the value of alfalfa hay for horses, as compared with timothy hay, when fed with grain and when fed alone. The alleged diuretic properties of alfalfa were also investigated, as well as the amount of water consumed on different rations, and the comparative merits of oats and a mixture of bran and shorts.

In the first period of the first test reported 2 farm work horses fed a ration of 25 lbs. of alfalfa hay and 10 lbs. bran and shorts lost 4 lbs. in 95 days; 2 similar horses fed the same ration except that timothy hay replaced alfalfa, lost 124 lbs. The average cost of the 2 rations was 9.9 cts. and 12.3 cts. per day. The rations were then reversed for 56 days, and the horses fed alfalfa hay gained 75 lbs. while those fed timothy hay lost 60 lbs.

In a second test under practically the same experimental conditions, except that the grain ration was larger, averaging a little over 12 lbs. per day, the 2 horses on alfalfa hay gained 55 lbs. in 91 days while those fed the timothy hay lost 41 lbs. When the rations were reversed the horses on alfalfa hay gained 65 lbs. in 68 days, and those on timothy hay lost 100 lbs.

The rations were also tested for 39 days with 2 driving horses used for light work. In addition to some 12 lbs. of grain per day, 1 horse ate 8.3 lbs. timothy and the other 16 lbs. of alfalfa hay, on an average. On the former ration there was a loss of 50 lbs., on the latter a gain of 10 lbs.

In the fourth test all the horses previously used were included, and also 2 additional driving horses used for light work. The work horses were fed 15 lbs. of hay and 12 lbs. of oats per head daily, and the driving horses 12 lbs. of hay and 9 lbs. of oats; in each case 2 horses were fed timothy and 2 alfalfa hay. In 180 days the horses fed timothy lost 189 lbs., while those fed alfalfa made a total gain of 8 lbs.

Using 2 of the work horses a test covering 60 days was made in which the rations were reversed every 10 days. The horses were fed the same amount of hay and grain, yet they ate 253 lbs. more alfalfa than timothy during an equal number of days, which also "brings out very clearly the fact that individuality is an important factor in feeding."

In all of these tests the alfalfa ration was the cheaper. The author notes that generally speaking the uneaten residue, i. e., waste, was also less on the alfalfa ration.

The merits of alfalfa hay fed without grain were also studied. In a 10-day test 2 work horses (idle during the test), weighing nearly 1,400 lbs. each, practically maintained their weight on an average daily ration of 19.8 lbs. alfalfa per head. The same horses fed alfalfa hay without grain for 21 days (working 9 hours a day) consumed on an average 32.6 lbs. alfalfa hay daily. One horse lost 2 lbs., the other 76 lbs. With very severe work 40 lbs. of alfalfa hay was not an adequate ration, though it was apparently as large a quantity as could be eaten. It was noted that the team was not as lively as on a ration of hay and grain.

The author's principal conclusions regarding the feeding of alfalfa are in effect as follows:

In comparing alfalfa and timothy as roughage for horses, the results of the tests, under varying conditions of work, show that it is not as difficult to maintain the weights of horses when fed alfalfa as when fed timothy. With timothy at $6 and alfalfa at $4 per ton the cost of maintenance was greater in every case, except one, on timothy than on alfalfa. The appearance of the horses in every comparison of alfalfa and timothy was in favor of the alfalfa-fed horse. When alfalfa and timothy were fed ad libitum much greater quantities of alfalfa were consumed.

No ill results were noted on the health of the horses by long-continued alfalfa feeding. Attacks of colic and other digestive disorders can be prevented by a judicious system of feeding. The amount of hay fed on most Utah farms could be reduced at least one-half. It may be economical to reduce the amount of hay and increase the amount of grain fed to horses.

Twenty pounds of alfalfa per day proved sufficient to maintain the weights of horses weighing nearly 1,400 lbs. when at rest. When at heavy work, 32.62 lbs. of alfalfa per day was barely sufficient to maintain the weights of the same horses.

The author discusses the amount of feed required by horses, and emphasizes the fact that rations often fed are too large. In the experiment reported above, in which horses weighing 1,400 lbs. practically maintained their weight on a daily ration of 15 lbs. of timothy hay and 12 lbs. of oats, it was calculated that the ration furnished in digestible nutrients 1.72 lbs. protein, 0.667 lb. fat, 10.5 lbs. carbohydrates, the nutritive ratio being 1:7. Similar values for the ration made up of 15 lbs. alfalfa hay and 12 lbs. of oats were protein 0.299 lb., fat 0.519 lb., and carbohydrates 10.93 lbs., the nutritive ratio being 1:4.4. As noted by the author, these values are considerably below the amounts called for by Wolff's standard for a horse doing heavy work.

The diuretic effect of alfalfa hay was studied with 2 horses in a test covering 60 days. Each horse was fed 15 lbs. of oats; in addition one was given 25 lbs. of alfalfa hay, the other a like amount of timothy. The rations were reversed every 10 days. The attempt was made to collect all the urine, and the results include only the days on which this was successfully accomplished. On the timothy ration the average amount of water consumed per horse was 81.92 lbs. per day, the average daily excretion of urine 16.4 lbs. Corresponding values for the alfalfa ration were 90.76 lbs. and 27.26 lbs. This confirms the fact observed at the station that alfalfa increases the amount of urine. The test was discussed with especial reference to the effect of early, medium, and late cut first crop alfalfa. It appeared, according to the author, that the early cut alfalfa hay caused the greatest excretion of urine and the late cut alfalfa the least, although the consumption of water did not vary in the same way. The greater consumption of water when horses are fed alfalfa resulted in a greater elimination by the kidneys, "but we have no evidence that this greater elimination is in any way detrimental to the health of horses." That the amount of water in the feeding stuffs did not cause the increased amount of urine is shown by the fact that the timothy hay contained 10.7 per cent and the alfalfa hay from 9.64 to 10.53 per cent. The specific gravity of the urine on the alfalfa ration was greater than that on the timothy ration, as was also the nitrogen excreted. The author calculates the balance of income and outgo of nitrogen, i. e., the metabolism of this element.

Considering the tests as a whole the author discusses the comparative value of oats and a mixture of bran and shorts. In his opinion "it is evident, from a study of the experiments during 4 periods of which bran and shorts were used and during 1 when oats made up the grain ration, that bran and shorts may be substituted for the oats whenever the horses are fed alfalfa or timothy."

What is a maintenance ration for a horse? F. E. Emery (*Wyoming Sta. Rpt. 1902, pp. 26-31*).—A feeding test made with 4 farm horses required to perform light work showed that they maintained their weight on an average daily ration of 13.5 lbs. good alfalfa hay. The horses were allowed free access to water and a pile of oat straw, but were fed no grain. The amount of straw eaten was not recorded. In a second test made with 2 horses it was found that weight was maintained on an average daily ration of 13.75 lbs. alfalfa hay and 2.25 lbs. oat straw per 1,000 lbs. live weight. It was calculated that this ration would furnish 1.85 lbs. protein, 0.14 lb. fat, and 6.27 lbs. nitrogen-free extract, the nutritive ratio being 1:3.5. As pointed out, this ration furnishes more protein and less carbohydrates and fat, and has a narrower nutritive ratio, than is called for by Wolff's standard.

Maintenance ration for driving horse, F. E. Emery (*Wyoming Sta. Rpt. 1902, pp. 41, 42*).—In a test made with a driving horse required to perform a moderate amount of work it was found that his weight—1,100 to 1,200 lbs.—was maintained on a ration of 21.25 lbs. alfalfa hay and 3.4 lbs. oat straw, or 17.71 and 2.83 lbs., respectively, per 1,000 lbs. live weight. In this test the horse was driven daily some 6 miles at a pace which it is stated was well up to the limit of his road gait. The author calculates that this ration will furnish 2.38 lbs. protein, 1.8 lbs. fat, and 8.22 lbs. carbohydrates per 1,000 lbs. live weight, the nutritive ratio being 1:3.6. It is noted by the author that the amount of protein is greater, the amount of fat and carbohydrates less, and the nutritive ratio narrower, than is called for by Wolff's standard for a horse at light work.

The breakage of eggs, H. Faber (*Ugeskr. Landm., 47 (1902), No. 14, pp. 161-164*).—Investigations showed that the relative breakage in different months of Danish eggs shipped to the English market, on the basis of an average breakage of a hundred, was as follows: January, 85; February, 128; March, 116; April, 75; May, 73; June, 101; July, 106; August, 127; September, 110; October, 104; November, 88; and December, 87. The deductions were drawn from the examination of many thousands of boxes. The author also found that large eggs broke more easily than small ones. He recommends supplying poultry liberally with lime throughout the year, grading the eggs before packing, and carefully packing, since the loss due to breakage considerably exceeds the additional cost of packing material.—F. W. WOLL.

Eggs of hens fed meat, E. THIERRY (*Jour. Agr. Prat., n. ser., 3 (1902), No. 10, p. 319*).—A comparative study showed that hens fed flesh produced more and heavier eggs than those fed grain.

DAIRY FARMING—DAIRYING.

Alfalfa *v.* wheat bran for milch cows, F. E. EMERY (*Wyoming Sta. Rpt. 1902, pp. 39, 40*).—One cow was fed a ration containing 8 lbs. of wheat bran in addition to native hay for 2 periods of 10 days each, and a ration containing 3 lbs. of wheat bran in addition to alfalfa hay in the morning and native hay in the evening for an intervening period of 10 days. The hay was fed ad libitum. The ration containing alfalfa gave the lowest yield, but was the most economical.

The flat pea (Lathyrus sylvestris), its culture and feeding value for milch cows, G. ANDRÄ (*Landw. Jahrb., 31 (1902), No. 1, pp. 55–80*).—The culture and feeding value of the flat pea are discussed at some length and feeding experiments are reported. In rations having practically the same composition flat-pea hay was compared with clover hay. The experiment included 8 cows and lasted nearly 3 months. The results showed no variation in the composition of the milk, as regards total solids and fat, due to a change of rations. On the flat-pea ration, however, the average daily yield was decreased to the extent of 510 gm. of milk and 18.9 gm. of fat per cow. The live weight of the cows increased uniformly throughout the experiment.

Individual differences in the value of dairy cows, W. J. FRASER (*Illinois Sta. Circ. 50, pp. 8, figs. 4*).—An extract from Bulletin 66 of the station (E. S. R., 13, p. 883).

The production of milk and butter, L. MALPEAUX (*Compt. Rend. Cong. Soc. Aliment. Rat. Bét., 6 (1902), pp. 26–50*).—This has been noted from another source (E. S. R., 13, p. 883).

The use of milking machines in dairying, F. BORDAS and S. DE RACZKOWSKI (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 8, pp. 371, 372*).—Milk drawn by hand contained a much smaller number of bacteria and remained sweet for a longer period.

The composition of milk, H. D. RICHMOND (*Analyst, 27 (1902), No. 317, pp. 240–243*).—The average composition of 13,936 samples of milk analyzed during 1901 was as follows: Specific gravity, 1.0321; total solids, 12.63 per cent; fat 3.72 per cent, and solids-not-fat, 8.91 per cent. The evening's milk contained on an average 0.38 per cent more fat than the morning's milk. The lowest fat content occurred during May and June and the highest during November and December.

Studies of the proteids of milk led the author to conclude that casein and albumin are not decomposition products of one albuminoid existing in milk, and that casein is an acid having a strength greater than carbonic acid or boric acid, less than organic acids such as acetic and lactic, and the same as the second hydroxyl of phosphoric acid.

Analyses of 4 samples of human milk are reported. The sugar in human milk, according to the author, differs from lactose as regards polarization and reducing power.

The composition of colostrum, W. F. SUTHERST (*Chem. News, 86 (1902), No. 2223, pp. 1, 2, dgm. 1*). Colostrum was obtained from a Shorthorn cow twice a day for 10 days, and analyzed, the data being given in detail. The percentages of the different constituents for the first and last milkings, respectively, were as follows: Total solids, 22.878 and 16.058; ash, 1.034 and 0.814; fat, 2.302 and 4.796; lactose, 2.742 and 4.874; total albuminoids, 12.236 and 3.242; casein, 4.858 and 2.250; globulin, 5.321 and 0.198, and albumin, 1.454 and 0.562. The specific gravity decreased from 1.068 to 1.030. The percentage of globulin decreased very rapidly for the first 3 milkings and then remained practically constant. All the other constituents increased or decreased gradually, equilibrium being reached at about the ninth milking.

Variation in the phosphoric acid in milk during lactation, F. BORDAS and S. DE RACZKOWSKI (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 5, pp. 302, 303*).—Analyses of the milk of 7 cows in different stages of lactation showed a maximum content of phosphoric acid and lecithin at the beginning of lactation and a gradual decrease during the remainder of the period.

The hygiene of milk, W. STIEGER (*Die Hygiene der Milch. Leipzig: M. Heinsius Nachfolger, 1902, pp. VIII + 244, pls. 15, figs. 113*).—This treats in a general way of the production, handling, and preservation of milk and its products under hygienic conditions. Methods of testing are described and the feeding of infants is considered at some length.

The care and handling of milk, O. F. HUNZIKER (*New York Cornell Sta. Bul. 203, pp. 18, figs. 2, dgm. 1*).—The author discusses the source of bacteria in milk and the means of infection; straining, cooling, and aerating milk; pasteurization and sterilization; and storage and transportation. A strainer consisting of a wire gauze and 4 layers of cheese cloth has been found the most practical and efficient at the station. Milk kept at 50° F. remained practically unchanged for several days, while milk kept at 98, 80, 70, and 60° curdled at the end of 27, 30, 48, and 72 hours, respectively. Many practical suggestions are made throughout the bulletin, which is popular in character.

Aeration of milk, C. E. MARSHALL (*Michigan Sta. Spec. Bul. 16, pp. 58*).—This is a detailed account of studies of the effect of aeration, considered apart from cooling, upon the condition and germ content of milk. Analyses were made of the gases in milk before, during, and after aeration. Experiments were conducted to determine the influence of bacteria and antiseptics upon the interchange of gases between milk and air. The effect of different percentages of carbon dioxid upon the development of bacteria was studied and many other experiments were performed. The gas content of the milk was found to contain on an average 81.5 per cent of carbon dioxid and 2.42 per cent of oxygen. Aeration reduced the percentage of carbon dioxid to about 35 and increased the oxygen content to about 20 per cent. The presence of carbon dioxid in quantities exceeding 33 per cent was found to restrain or prevent bacterial growth. The author draws the following conclusions:

"Milk undergoes aeration when exposed to air from the time it leaves the milk duct of the cow until it is consumed or made into milk products.

"This aeration is demonstrated by the reduction in the amount of carbon dioxid and the increase in the amount of oxygen.

"It has been shown that aerating methods which increase the surface of the milk exposed facilitate aeration greatly.

"Below a certain percentage the elimination of carbon dioxid becomes very difficult.

"By this interchange of gases between air and milk there is a great opportunity offered for the absorption of noxious gases by the milk, unless the interchange takes place in absolutely pure air.

"Agitation of milk favors the interchange of gases, because of the increased surface exposure.

"Odors and taints resulting from aromatic foods, physiological processes, and disease processes may be greatly reduced permanently.

"Odors and taints resulting from bacterial fermentations may be greatly reduced, but they will return upon the further development of bacteria.

"The oxidation of milk is a slow process in the presence of antiseptics.

"Where the oxygen disappears rapidly and carbon dioxid is formed in a confined air space over milk, this change is evidently due to bacterial activities.

"Closing milk cans from the air consequently reduces the amount of oxygen supply, therefore must change the conditions of germ life.

"Aeration does not change the germicidal action of milk.

"Aeration does not reduce the number of bacteria.

"Directly confined milk does not ferment more readily than aerated milk.

"Aeration does influence the amount of oxygen supply to the bacteria present. . . .

"The fermentations of milk are therefore influenced by aeration, favoring the production of nontoxic substances."

Aeration of milk, C. E. Marshall (*Michigan Sta. Bul. 201, pp. 214–216*).—This is a popular summary of the above, suggestions as to the manner of conducting aeration being given substantially as follows: Aeration should be conducted at body temperature and carried out slowly over the most extensive surface possible. It should take place only in a pure atmosphere and immediately after milking, and should precede cooling. Aeration and cooling conducted simultaneously can not yield the most satisfactory results.

Standard milk and cream, W. J. Fraser (*Illinois Sta. Bul. 74, pp. 283–296, pls. 2; Circ. 51, pp. 12, pls. 2*).—The food value of milk and selling milk on the basis of composition are briefly discussed. The term "standard" is applied to milk or cream in which the fat has been brought to a certain percentage by the addition or removal of fat or skim milk. The author considers that a law requiring the standardization of milk and cream sold for direct consumption would result in justice to both seller and buyer, and argues for the adoption of such a system.

Standardization of milk and cream, O. Erf (*Illinois Sta. Bul. 75, pp. 297–309*).—Detailed directions are given for standardizing milk, which is defined as bringing the content of butter fat to a given percentage, regardless of the quality of the milk as produced by the cow. The necessary steps are the determination of fat by the Babcock method and the addition or removal of cream as may be necessary for this purpose. Skim milk may, of course, be used instead of cream. The same methods apply to the standardization of cream.

Use of hydrogen peroxid for the preservation of milk, J. Huwart (*Rev. Gén. Lait, 1 (1902), No. 8, pp. 180–183*).—The pasteurization of milk immediately after the addition of hydrogen peroxid removed about two-thirds of this antiseptic, and pasteurization at the end of 18 hours removed all traces. The estimation of hydrogen peroxid in milk by the liberation and determination of iodin gave satisfactory results.

Hydrogen peroxid for preserving milk, R. Lezé (*Jour. Agr. Prat., n. ser., 4 (1902), No. 34, p. 249*).—The advantages of this preservative are pointed out, but its practical use in the preservation of milk is considered doubtful.

The acidity of milk: Its accurate and rapid determination, origin, variation under different influences, and importance, P. Dornic (*Rev. Gén. Lait, 1 (1902), Nos. 10, pp. 217–224; 11, pp. 241–249; 12, pp. 268–277; 13, pp. 298–303; 14, pp. 319–324*).

Composition of separator slime, C. Barthel (*Rev. Gén. Lait, 1 (1902), No. 9, pp. 193–196*).—The average of analyses made by the author is as follows: Water 67.50, casein 12.56, cellular matter 13.28, nonnitrogenous organic matter 3.99, and ash 2.67 per cent.

Study of rapid and slow creaming milks, M. Henseval (*Rev. Gén. Lait, 1 (1902), No. 16, pp. 366–373, figs. 2; Bul. Agr. [Brussels], 18 (1902), No. 2, pp. 256–263, figs. 2*).—A comparative study was made of 2 types of milk, one showing a rapid and one a slow rising of the cream. The fat globules were measured and the milk and butter analyzed as a basis for further study. As regards composition the 2 types of milk were normal. The rapid creaming milk showed the presence of numerous large fat globules, often in clumps, while in the other type the grouping of globules was rare, and the larger ones were more or less irregular in outline. Centrifugal separation of the slow creaming milk was less complete.

The influence of creaming on the distribution of the principal constituents of milk, F. BORDAS and S. DE RACZKOWSKI (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 7, pp. 354, 355*).—This study was made with particular reference to phosphoric acid and lecithin. From 3,200 cc. of whole milk submitted to centrifugal separation 2,800 cc. of skim milk and 370 cc. of cream were obtained. The whole milk, skim milk, and cream contained, respectively, 0.176, 0.184, and 0.096 per cent of total phosphoric acid and 0.058, 0.018, and 0.334 per cent of lecithin, showing that about 69 per cent of the lecithin was removed with the cream.

Study of pasteurization of cream in dairying, L. MARCAS and M. HENSEVAL (*Rev. Gén. Lait, 1 (1902), Nos. 17, pp. 387–395; 18, pp. 413–423*).—Three series of experiments are reported in detail in which butter was made under similar conditions from cream pasteurized at temperatures ranging from 70 to 90° C. Pasteurization increased slightly the yield of butter in all cases, though the difference was too small to be considered of practical importance. The butter from pasteurized cream had a higher water content, which accounted for the increase in yield. As judged by 2 experts, the pasteurized butter was superior in quality.

The influence of food on the quantity of volatile fatty acids in butter, H. WEIGMANN and O. HENZOLD (*Rev. Gén. Lait, 1 (1902), Nos. 7, pp. 145–149; 8, pp. 173–180; 9, pp. 196–202*).—Four series of experiments are reported. Different rations were found to influence the content of volatile fatty acids in butter. When this influence was unfavorable it was apparent, usually, immediately following a change of rations rather than after several days; but when favorable the increase in the content of volatile fatty acids followed slowly. The cause of this variation is attributed to the nature of the food rather than to a change in nutrition, although in certain cases a change of rations in itself appears to exert a similar influence.

Fluorids as butter preservatives, with observations on their influence on artificial digestion, O. and C. W. HEHNER (*Analyst, 27 (1902), No. 315, pp. 173–179*).—The presence of fluorids was detected in 20 samples of French butter, the amount present being estimated at from 1 to 4 grains of sodium fluorid per pound of butter. In artificial-digestion experiments the presence of 0.04 per cent of sodium fluorid or its equivalent in ammonium fluorid inhibited the action of ptyalin and pepsin and to a less extent that of diastase. The action of rennet was prevented when fluorids were added in excess of the amount precipitable by the calcium salts in the milk.

The Institute of Butter Control in Friesland, M. BEAU (*Jour. Agr. Prat., n. ser., 4 (1902), No. 39, pp. 408–411*).—A summarized account is given of the results of the examination of butter in Friesland from May, 1901, to April, 1902. During the year 1,341 samples of butter were analyzed. The average Reichert-Wollny number was 28.69, corresponding to a percentage of volatile fatty acids of 5.71. During the summer months, however, 44 per cent of the samples showed a Reichert-Wollny number less than 27.63, which corresponds to the standard of 5.5 per cent for volatile fatty acids. During the winter months 29 per cent of the samples were below this standard.

Characteristics of butter from human milk, SAUVAITRE (*Abs. in Ann. Chim. Analyt., 7 (1902), No. 4, pp. 143–145*).—In general the physical and chemical properties of butter from human milk corresponded closely to those of butter from cow's milk. In human butter, however, the Reichert number was only 15.8.

Estimation of the quantity of casein precipitable by rennet, L. LINDET (*Rev. Gén. Lait, 1 (1902), No. 12, pp. 265–268*).—From determinations of the specific gravity and fat content of the milk, the specific gravity of the milk less the fat is calculated, a formula and a table being given for this purpose. A sample of milk is curdled with rennet under the ordinary conditions of cheese making and the specific gravity of the whey is determined. A lactometer graduated from 1,025 to 1,035 is used, each difference of 1 between the reading for the whey and the calculated reading for the skim milk being estimated as equivalent to 3.5 gm. of casein per liter of milk coagulable by rennet.

Influence of low temperatures on the ripening of cheese, E. von Freudenreich (*Rev. Gén. Lait, 1 (1902), No. 21, pp. 481–485*).—Four Emmenthaler cheeses were each made from 15 liters of milk, artificial rennet being used. Cheeses 1 and 2 were inoculated with liquefying micrococci and lactic acid bacteria, while cheeses 3 and 4 were made without the addition of cultures. Cheeses 1 and 3 were placed at once in cold storage. Cheeses 2 and 4 were kept at about 20° C. for 24 hours and then placed in cold storage. After remaining for 5 months at temperatures below 10° the 4 cheeses were subjected to chemical and bacteriological examinations. In percentages of total nitrogen the 4 cheeses, in numerical order, showed 10.53, 20.50, 10.19, and 10.64 per cent of soluble nitrogen, and 0.35, 0.64, 1.70, and 1.66 per cent of nitrogen of the products of decomposition. The greater amount of soluble nitrogen in No. 2 was attributed to the development of the micrococci during the first 24 hours before this cheese was placed in cold storage. The numbers of bacteria per gram in the 4 cheeses were about 600, 560, 200, and 146 million. A considerable increase in the number of lactic acid bacteria was apparent. As judged by taste, it is stated that cheeses 1 and 3 showed no ripening, while cheeses 2 and 4 showed ripening to a slight degree, cheese 2, however, being somewhat bitter. The author concludes that normal ripening apparently did not take place under the conditions of the experiment.

Edam cheese, M. Beau (*Jour. Agr. Prat., n. ser., 4 (1902), Nos. 34, pp. 246–248; 35, pp. 274, 275*).—An account of this industry in Holland.

Summary of the proceedings of the Second National Congress of Dairying, M. Henseval, (*Rev. Gén. Lait, 1 (1902), Nos. 15, pp. 346–355; 16, pp. 374–378; 17, pp. 397–402*).—The congress was held at Brussels, Belgium, in April, 1902. Reports along the following lines were presented and discussed: The influence of pasteurization upon the quality and yield of butter, pasteurization of the by-products of the dairy, inspection of dairies, commercial treaties and uniform legislation relating to dairying, and supervision of the butter trade.

Examination of apparatus for determinng butter fat in milk and cream, A. L. Winton (*Connecticut State Sta. Rpt. 1901, pt. 4, pp. 279–283*).—During the few months in which the State law concerning the purchase of milk and cream has been in operation the station has tested 222 pipettes, 463 milk test-bottles, and 1,810 cream test-bottles, of which 58 pieces were found inaccurate. The methods employed in testing are stated.

VETERINARY SCIENCE AND PRACTICE.

Proceedings of the American Veterinary Medical Association for 1901 (*St. Paul: Webb Pub. Co., 1902, pp. 408, figs. 17*).—The thirty-eighth annual meeting of the Association was held at Atlantic City, N. J., September 3 to 6, 1901. The address of the president, T. W. Butler, contained a brief review of progress in veterinary medicine and various suggestions concerning the code of ethics for the regulation of veterinarians.

The subject of tuberculosis received an extended discussion, and a resolution was finally adopted declaring, among other things, "that the evidence of accidental inoculations and clinical observations apparently demonstrate that bovine tuberculosis may be communicated to man; . . . that experiments showing the difficulty or the impossibility of transmitting human tuberculosis in a fatal form to cattle can not be accepted as evidence that the bovine bacillus, which is far more virulent and fatal to many animals, can not infect man; . . . that if it is admitted that human tuberculosis is not communicable to cattle under ordinary conditions, this should be a great encouragement for the eradication of bovine tuberculosis, since it would prove that the danger often feared that cattle, if freed from the disease, would be immediately reinfected from mankind, does not exist in fact and need not be considered." A resolution was also adopted instructing the committee on diseases to investigate the subject of anthrax and make a report at the next meeting of the association.

V. A. Moore reported some preliminary observations on skin disinfection and wound infection. The 3 species of bacteria found to be of special interest in this connection are an undetermined species of streptococcus, an undetermined species of micrococcus, and *M. pyogenes aureus.* Numerous experiments were made in the disinfection of the skin, the disinfectants being carbolic acid, potassium permanganate, lysol, Sanitas, and corrosive sublimate in various strengths. The only disinfectant which thoroughly sterilized the skin in any case was corrosive sublimate in a 0.1 or 0.2 per cent solution.

W. H. Dalrymple gave a general account of the prevalence of anthrax in Louisiana, the spread of which he stated to be largely due to carelessness in allowing the carcasses of animals dead of anthrax to remain upon the ground. As the result of this, the disease may be rapidly carried from one place to another by the various insects which visit such carcasses, especially species of the family Tabanidæ. Various birds and mammals are also instrumental in spreading the disease.

Some obstructions to efficient meat and milk inspection were discussed by C. A. Cary; and G. R. White presented an account of municipal meat inspection legislation, with special reference to the law and the rules and regulations of the board of health of the city of Nashville. The difficulties encountered by the live-stock inspectors in large stock yards were briefly considered by S. G. Hendren.

J. J. Repp read a paper on the Transmission of Tuberculosis through Meat and Milk. The literature of the subject was critically reviewed, and the practical conclusion drawn that meat and milk from highly tuberculous animals are unfit for food. A paper on the Attitude of the Farmer toward the Tuberculin Test was presented by C. W. Gay. Attention was called to the objections raised by the farmers to the application of the tuberculin test. These objections are said to be due principally to the fear of having apparently healthy cattle condemned, and to the lively discussion of the subject of tuberculosis which has appeared in all periodicals, including farm journals, since the publication of Koch's address.

J. C. Roberts discussed the Texas-fever problem in the South, arguing that immunity to Texas fever is not hereditary but must be acquired anew by every animal; that nonimmune cattle of all ages are subject to the disease, and that southern cattle, when raised free of ticks, are as susceptible as northern cattle. In a paper on Texas fever in native South Carolina cattle, G. E. Nesom stated that the annual loss from this disease in that State is about $50,000. It was recommended that the upper portion of the State should be freed from ticks and that the lower portion be rigidly quarantined.

The desirability of appointing veterinarians on State boards of health was discussed by S. B. Nelson, who regarded such appointments as necessary on account of the many outbreaks of diseases which are common to man and domesticated animals. J. B. Paige presented an elaborate discussion on the subject of stable ventilation. He recommended the adoption of some form of ventilating device by means of which the greatest possible amount of air can be secured without reducing the temperature too greatly in cold weather. .

Lameness in horses was discussed by W. C. Fair, who stated that during a practice of 30 years, 25 per cent of his cases have been lameness. Various directions were given to make possible a short and rapid diagnosis of the cause of lameness. In a paper on radical operations for bursal enlargements, C. C. Lyford considered a seton almost indispensable for keeping open the operation wounds in enlarged bursæ and thus making possible a thorough washing with antiseptic solutions. A paper on the value of a few common operations on the horse by L. A. Merillat gave brief notes on various forms of neurectomy, tenotomy, and the use of the actual cautery.

L. Van Es discussed the subject of colleges and associations as guardians of the standing of veterinarians among the profession, and the relation of the veterinarian to his profession and the public was discussed by W. Shaw. A paper on the pathological anatomy and microscopical diagnosis of rabies was read by A. Eichhorn. The author stated that the plexiform ganglion shows greater or less changes in all stages of rabies, and that a positive diagnosis can be made most easily from an examination of this ganglion. W. McEachran discussed the symptoms, diagnosis, pathological changes, and treatment of distemper in a dog.

In discussing the diagnosis of glanders by the Strauss method, L. Frothingham reported an extensive series of experiments on guinea pigs inoculated with material obtained from cases of glanders in horse and man. While a certain percentage of these experiments gave negative results, the author believes that this method for diagnosis of glanders is the most valuable one which can be used.

Notes are given on the proceedings of the fifth annual meeting of the Association of Experiment Station Veterinarians of the United States, which was held in connection with the above meeting.

The address of the president, R. R. Dinwiddie, is reported, together with a paper by C. A. Cary on the preparation of bouillon, gelatin, and agar-agar, and one by M. Jacobs on the subject of nodular disease in sheep.

The duration of the life of pathogenic bacteria in minute particles of water and on dust particles, F. KIRSTEIN (*Ztschr. Hyg. u. Infectionskrank., 39 (1902), No. 1, pp. 93-170*).—The purpose of the experiments which are reported in this article was primarily to determine the length of time during which pathogenic bacteria which are associated with particles of dust or minute drops of moisture may remain alive in rooms subjected to ordinary illumination with diffuse sunlight. Experiments with the tubercle bacillus showed that this organism preserved its vitality when thrown out in moisture in the form of the finest possible particles for at least 4 days. Tubercle bacilli which had been thrown out in a spray in that manner and collected 8 days after the spraying were found to have lost their virulence. The period at which the tubercle bacilli die under conditions mentioned is, therefore, between 4 and 8 days. The experiments of other authors along this line with the tubercle bacillus are discussed in this connection. It was argued that the great variation in results obtained by different authors is due largely to the fact that the tubercle bacilli were encased in drops of moisture or sputum of very different size in different experiments. The author found that where tubercle bacilli were protected from the action of diffuse sunlight and desiccation in particles of sputum of considerable size, the organisms preserved their vitality for a period of 3 months or more.

In similar experiments with the organism of fowl cholera it was found that these bacilli lost their vitality after a period of 17 hours. Similar experiments were also made with a number of staphylococci and streptococci and similar results were obtained. In all cases it was found that when the organisms were not protected by a thick film or other substance from the action of the light and air, their vitality disappeared within a few days at most and usually within a few hours.

The properties and nature of mixtures of toxins and their antitoxins, J. DANYSZ (*Ann. Inst. Pasteur, 16 (1902), No. 5, pp. 331-345*).—The experiments reported in this article by the author were confined largely to a study of the properties of mixtures of ricin and antiricin. A solution of ricin was made in the usual manner and of such a strength that 1 cc. of the solution of ricin contained enough for 1,000 lethal doses for rabbits. Antiricin serum was obtained by immunizing a goat. After one series of injections with the solution of ricin 1 cc. of the serum of this goat was sufficient to neutralize the action of 0.5 cc. Later, after another series of injections, 1 cc. of the serum neutralized 1 cc. of the ricin and still later 2 cc. An extensive series of experiments was made in which various mixtures of these 2 substances were used. During these experiments it was found that the formation of precipitates in the mixtures in different proportions of ricin and antiricin, as well as the variable properties of the mixtures containing identical quantities of toxin and antitoxin, and finally the at once antitoxic and toxic properties of these mixtures in any proportion proved beyond question that these 2 substances fix or impregnate each other reciprocally in variable proportions. When mixed together, toxins and antitoxins do not form a simple compound but rather a series of compounds in which one of the substances is more or less impregnated by the other. The mixtures are therefore more or less active.

Agglutination in cases of mixed infection and the diagnosis of these infections, A. Castellani (*Ztschr. Hyg. u. Infectionskrank., 40 (1902), No. 1, pp. 1–20*).—A brief review is given of the literature relating to this subject. The author's experiments included a study of mixed infections produced by simultaneous injection of different micro-organisms, the agglutination which occurs when a secondary infection is added to an already existing primary one, agglutination in mixed infection in man, and the diagnosis of mixed infections with the aid of the agglutination test. The results of these experiments indicate that in cases of experimental mixed infections which are produced simultaneously, the blood serum acquires an agglutinating power toward all micro-organisms with which the animal is inoculated. The beginning, the intensity, and the duration of the agglutination for each kind of organism are the same as in animals inoculated with but one species alone. When a secondary infection is added to a primary one near the beginning or toward the end of the latter the blood acquires an agglutinating power for the organisms of both infections, and this power does not differ from that which is manifested in case of simultaneous mixed infection.

Tuberculosis, E. von Behring, P. Römer, and W. G. Ruppel (*Beitr. Exper. Ther., 1902, No. 5, pp. 90, figs. 42*).—The experiments for the purpose of perfecting a method of immunizing cattle against tuberculosis have been carried on at the Institute for Hygiene and Experimental Therapy of the University of Marburg for a number of years, and have led to results of great importance from a practical as well as a scientific standpoint. The most important conclusions which are drawn from these investigations are that cattle can be perfectly immunized against tuberculosis; that tuberculosis of man and cattle is one and the same disease; that the agglutination method for recognizing tuberculosis, as proposed by Arloing and as modified by von Behring, is unsatisfactory; and that mammals upon which experiments have been made may be arranged with regard to their susceptibility to tuberculosis in the following order, beginning with the most susceptible: Guinea pigs, rabbits, dogs, goats, cattle, horses, sheep, and white mice. During the experiments which are described in the present report, and which extended over a period of more than 5 years, an exceedingly virulent form of tubercle culture was produced which killed cattle within 2 or 3 weeks, under symptoms of miliary tuberculcsis. This culture was used for testing the degree of immunity of animals which had been treated, and also for testing the susceptibility of the control animals. It was found possible to secure cultures of tubercle bacilli of almost any origin sufficiently attenuated to produce a mild form of the disease in cattle, and thus to confer upon them a lasting immunity. All cultures of bacilli of different origin are, however, not equally well suited for use in immunizing cattle. For practical purposes the authors recommend that neither tubercle bacilli of bovine origin nor those from human patients which have been increased in virulence by passage through cattle or goats should be used in attempts to immunize cattle. The best results were obtained from the use of bacilli of human origin which have been cultivated on artificial media for about 6 years. As a rule young cattle, from 5 to 7 months old, were selected for the experiments. Each animal received intravenously 1 mg. of a serum culture 4 to 6 weeks old; after 4 weeks the animal received 25 mg. of the same culture. The effect of the first inoculation was usually noticed in an elevation of temperature, slight loss of flesh, coughing in some instances, and a susceptibility to tuberculin reaction. The animals, however, recovered usually within a week or 10 days and did not react to tuberculin thereafter. The second inoculation produced milder symptoms and the reaction persisted for a shorter time. After this treatment, which in some cases was repeated a larger number of times, the animals proved to be immune to inoculation with virulent cultures which were sufficient to kill the control animals within a few weeks. The immunized animals also proved resistant to infection by natural methods, as shown by exposure to cattle suffering from advanced tuberculosis.

The authors consider their method of immunization to be strictly analogous to vaccination in man for smallpox. The term, however, was rejected on account of its association with smallpox and on account of the derivation of the word. The term "jennerization" is chosen for the method adopted by the authors for immunizing cattle. The process which takes place in the jennerization of cattle is therefore considered as an isopathic autoimmunization.

Many of the animals which have been immunized at the Marburg institute have been exposed for a number of years to natural infection, and have all shown perfect resistance to the disease. It is considered, however, that the method has not been tested sufficiently to determine with certainty whether immunization against artificial infection is an easier or more difficult matter than immunization against natural infection. This question will be tested more extensively in future experiments. In a number of experimental cattle which had been jennerized evidence of apparent infection was obtained upon post-mortem examination, but this apparent infection persisted for a short time only, when the attenuated bacilli died or became encapsuled. In the cases in which small tuberculous foci were produced in the lungs as the result of jennerization the authors used much more virulent cultures than were actually required for producing immunity. This was done in order to gain some knowledge of the limits of virulence of cultures which could safely be used. The authors believe that young cattle may be immunized against tuberculosis by the use of cultures of tubercle bacilli, which will not produce any bad effects in the animals. It is the intention of the authors to conduct further experiments for the purpose of determining whether inoculation of fresh cultures of human origin may not be preceded by inoculation with tubercle bacilli cultivated in vacuum, with bacilli attenuated according to Arloing's method, or even with tubercle bacilli from fowls. Subsequent experiments must also determine whether the dose of 25 mg. is sufficient in all cases to produce a permanent immunity, and whether any danger would attend the use of larger doses.

The comparative virulence of the tubercle bacillus from human and bovine sources, M. P. RAVENEL (*Pennsylvania Dept. Agr. Rpt. 1901, pt. 1, pp. 286–324; Jour. Com. Med. and Vet. Arch., 23* (*1902*), *Nos. 2, pp. 65–81; 3, pp. 138–156*).—The experiments which are reported in this paper involved 2 lines of work, the isolation and study of pure cultures of tubercle bacilli from various sources in man and cattle, and the testing of the pathogenic power of tubercles of human and bovine origin. A considerable variety of animals was employed in these experiments for testing the virulence of pure culture and tuberculous material. The experimental animals included guinea pigs, rabbits, dogs, cats, horses, goats, calves, sheep, and pigs. Detailed notes are given on the technical methods employed in securing pure cultures of the tubercle bacillus from bovine tubercles and from human sputum. The conditions surrounding the various inoculation experiments and the subsequent fate of all such experimental cases are carefully described. The number of experiments conducted was sufficient to justify the drawing of quite comprehensive conclusions. The author's general conclusions may be summarized as follows:

The tubercle bacillus of bovine origin exhibits quite constant and persistent peculiarities of growth and morphology, by means of which it may be differentiated from the form of tubercle bacillus commonly found in man. Pure cultures of bacilli from the 2 sources differ decidedly in pathogenic power, and this property affords another means of differentiating the 2 forms. The bovine tubercle bacillus is much more pathogenic than that of human origin for all species of experimental animals which were tested, with the possible exception of hogs, which appeared to be very susceptible to both forms of the bacillus. Tuberculous material from cattle and from man corresponds closely to pure cultures of tubercle bacillus from the 2 sources in regard to its comparative pathogenic power for all animals which were tested. The author believes that he is justified from evidence at hand in assuming that the bovine tubercle bacillus possesses a higher degree of pathogenic power than the human bacillus for man as well as the domesticated animals which have been tested.

Detailed notes on the numerous experimental cases are presented in tabular form. From these tables it is seen that in general the infection of experimental animals from tubercle bacillus of human origin was only slight or took place after a longer incubation period than in the case of infection from the bovine tubercle bacillus. In many cases, it should also be observed, no infection whatever took place.

The average life of guinea pigs inoculated with human tubercle bacillus was more than twice that of those which were infected with bovine bacilli. The rabbits which were inoculated with human tubercle bacilli gained in weight and had to be killed in order to conduct the post-mortem examination, while extensive infection was produced in other rabbits from inoculation of bovine tubercle material.

Influence of the toxons of tuberculin upon the development of experimental tuberculosis, S. Arloing and Descos (*Compt. Rend. Soc. Biol. Paris, 54 (1902), No. 2, pp. 52, 53*).—The authors had already demonstrated that it was possible to destroy a considerable part of the toxon of tuberculin by the addition of a definite quantity of antituberculin serum and that the persistent toxicity was due to the presence of toxon. Further experiments were conducted on rabbits and guinea pigs. The experimental animals were divided into 3 lots, and all were inoculated with tuberculosis at the same time. The first lot had received preventive inoculations of tuberculin and serum previous to the inoculation of tuberculosis; the third lot received curative inoculations of the same mixture, after inoculation with tuberculosis; while the second lot was simply inoculated with the tubercle bacilli, and served as a check upon the other lots. As the result of these experiments the authors conclude that tuberculin neutralized by serum and reduced in its content of toxons does not give better results in combating tuberculosis than tuberculin or antituberculin serum used separately. Inoculation for the purpose of prevention or cure appeared to favor the development of tubercular lesions and to augment their extension. When employed for curative purposes the method seemed to hasten death, if the tuberculin was not sufficiently neutralized. It was concluded, therefore, that the toxons of tuberculin possess a certain amount of toxicity, and also the property of favoring the development of experimental tuberculosis.

Chemotactic properties of various tuberculous sera, F. Arloing (*Compt. Rend. Soc. Biol. Paris, 54 (1902), No. 17, pp. 556–558*).—The author studied the serum of normal cows, of cows inoculated hypodermically with tuberculous cultures, cows affected with spontaneous tuberculosis of a generalized form, and goats inoculated with a fluid obtained by filtering tuberculous material. It was found as a result of these experiments that antituberculous serum is endowed with a positive chemotactic action which is not possessed by the serum of healthy cows or that of cows in advanced stages of tuberculosis. In experiments on goats it was found that repeated injections of the fluid obtained by filtering tuberculous material conferred a more pronounced chemotactic action upon the serum of experimental goats, rendering it more decidedly antituberculous.

Contagion and tuberculosis in man and beast, G. F. KEENE (*Rhode Island State Bd. Agr. Rpt. 1901, pp. 83–93*).—This article is of a controversial nature and contains a brief summary of evidence which indicates the possibility of transmission of tuberculosis from animals to man.

Further contribution to the possibility of transmission of tuberculosis from man to hogs, M. TEMPEL (*Ztschr. Fleisch u. Milchhyg., 12 (1902), No. 8, pp. 231, 232*).—The author had previously suspected the possibility of transmission of tuberculosis from tuberculous attendants to hogs. A number of cases of tuberculosis in hogs have been observed in which the disease appeared to have gained entrance through the wound in the scrotum in consequence of the operation of emasculation. Further observation on this point indicated that such cases are rather frequent. In one instance 4 hogs were apparently infected in that manner by an operator who was suffering from tuberculosis of the larynx and who had the habit of holding his knife between his teeth.

Is tuberculosis hereditary? A. VAN LEEUWEN (*Tijdschr. Veeartsenijk. Maanblad, 29 (1902), No. 5, pp. 197–201*).—This article is of a controversial nature, and in it the author makes the assertion that even if tuberculosis is not strictly hereditary, it may nevertheless be congenital or may take its origin during the development of the fetus. It is also argued that evidence exists for the assumption of predisposition to tuberculosis in the offspring of tuberculous animals.

The tuberculin test for tuberculosis, D. E. SALMON (*U. S. Dept. Agr. Yearbook 1901, pp. 581–592*).—The author presents a brief review of the opinions of various European and American investigators as to the efficacy and effect of the tuberculin test. It is concluded that the test is exceedingly accurate, that by its use tuberculosis in its incipient stage may be detected, and that no injurious effects are produced by tuberculin in healthy cattle.

A report on the proceedings of the British Congress on Tuberculosis, held in London, July, 1901, M. P. RAVENEL (*Pennsylvania Dept. Agr. Rpt. 1901, pt. 1, pp. 447–488*).

Diagnosis of anthrax, J. BONGERT (*Ztschr. Fleisch u. Milchhyg., 12 (1902), No. 7, pp. 193–202, figs. 8*).—The objects of the experiments reported in this paper were to determine how long after death the anthrax bacillus could be demonstrated in material from the dead body by one or another of the staining methods of Johne, Klett, and Olt, and also to determine the best and surest method for identifying the anthrax bacillus in such material. During these experiments it was found that the demonstration of anthrax bacilli by streak cultures frequently failed. The causes of these failures were found in the changes in form that the anthrax bacillus undergoes in consequence of the action of putrefactive bacteria and in the fact that anthrax bacilli are frequently not present in the blood in sufficient numbers to enable their ready identification by streak cultures. As a result of the experiments the author concludes that the morphological demonstration of anthrax bacillus in streak culture does not offer a certain means of determining whether a given animal died of anthrax or not. The best and most certain method of bacteriological diagnosis of anthrax is found in plate cultures. The most suitable method for preserving anthrax material which is to be studied later or shipped some distance is by slow drying of the virulent matter in a thick layer upon glass slides or on the inside of glass tubes.

The disinfection of animal hair by means of steam, PROSKAUER and CONRADI (*Ztschr. Hyg. u. Infectionskrank., 40 (1901), No. 1, pp. 134–140*).—Experiments were made for the purpose of determining the effectiveness of different methods in killing anthrax spores on animal hair. Three forms of steam sterilizing apparatus were used, and it was found impossible to obtain the same results by the 3 forms of apparatus. It is concluded from these experiments that the differences in results which have thus far been recorded are due to slight differences in the operation of the sterilizing apparatus.

Tick fever or murrain in southern cattle, J. C. ROBERT (*Mississippi Sta. Bul. 73, pp. 24, figs. 2*).—In this bulletin the author presents a general account of Texas fever. Notes are given on the effect of water on the hatching of the eggs; the effect of light and cold upon incubation; the effect of water, cold, and rainfall upon the ticks; the length of life of the ticks; the effect of small numbers and large numbers of ticks upon calves; the effect of a few ticks on cattle more than 12 months old, and the effect of large numbers of ticks on cattle past the age of 12 or 18 months; symptoms of Texas fever; post-mortem findings; relation of seasons of the year to the disease; occurrence of Texas fever among southern cattle; method of vaccination against Texas fever; curative treatment; and immunization by infestation of young animals with ticks. The longest period in which the author has kept ticks alive without food is 3 months. It is stated that there are many farms throughout Mississippi on which no ticks occur, that ticks are never found in cultivated fields, in pastures and woods that have not been occupied by infested cattle for 12 months, or on land which is annually washed by an overflow of water. A number of observations are recorded which show that immunity to Texas fever is not inherited, and that consequently the calves of immune cattle must themselves be immunized in order to acquire protection. Since it is considered an exceedingly difficult matter to eradicate the cattle tick from the whole State, it is suggested that attention should be given to infesting all young calves with a few ticks so as to render them immune and thus to protect the owner against subsequent loss from infection with Texas fever.

Clinical notes on cases of azoturia, hæmoglobinuria, and acorn poisoning, E. J. THORBURN (*Vet. Jour., n. ser., 5 (1902), No. 26, pp. 102–106*).—With regard to azoturia the author argues that much doubt still remains concerning the cause of the disease, the usual symptoms, and most effective treatment. In cases observed by the author no change had recently been made in the feed, no period of rest preceded the attacks, and the distance which the horses had traveled before acute symptoms developed were 10 to 18 miles rather than 1 or 2 miles, which is mentioned as the usual distance in text-book treatment of this disease. While full doses of aloes are usually given in treating azoturia, the author reports bad results from too large or too frequent doses, and advises that some care be taken in administering this remedy.

Notes are also given on a number of cases of hæmoglobinuria, with details on the conditions under which the disease occurred and the usual symptoms. In treating this disease it was recommended that animals first be removed from the place where they became infected, and either put on different pasture or in the stable, according to the time of year. Full doses of purgatives should be administered, together with quinin and nux vomica in cases where loss of appetite is observed.

An unusual number of cases of acorn poisoning in cattle is reported. The symptoms are loss of appetite, grunting, prostration, and rapid emaciation, with a high temperature. In treating these cases of poisoning it is recommended that purgatives be first administered, followed by stimulants and digestive tonics.

On the actinomycosis-like development of some of the acid-resisting bacilli, A. C. ABBOTT and N. GILDERSLEEVE (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 12, Orig., pp. 547–550, pl. 1*).—The observations of the authors are considered as affording additional evidence in support of the belief that actinomyces, the tubercle bacillus, and certain of the acid-resisting bacilli are closely related botanically and should therefore be classified together from a morphological standpoint. The present paper is of a preliminary nature, and all the results of the authors' investigations are not stated. The organisms which were studied included the grass bacillus, timothy hay bacillus, and butter bacillus, as well as actinomyces and the tubercle bacillus. The authors accept the proposition made by Metschnikoff in 1898, that the bacillus of tuberculosis represents merely a phase in the development of a more complex parasite, and it is believed that the same view is equally applicable to the organisms belonging to the acid-resisting bacilli, and the authors suggest that they be all grouped together with the actinomyces or streptothrices.

Intravenous injections and the treatment of aphthous fever, E. Nocard (*Jour. Agricole* [*Paris*], *13* (*1902*), *No. 146, pp. 91–93*).—The method of Baccelli for treating aphthous fever is discussed by the author in a critical manner. Baccelli reported success in every case with a large number of animals in treating them for aphthous fever by intravenous injections with corrosive sublimate. The author reports that a commission has been established for the purpose of investigating the value of this method. The results thus far obtained by the commission have indicated no difference in the progress of the disease in animals which have received injections of corrosive sublimate and in those which have not.

Interim report upon cattle disease in Southern Rhodesia, W. Robertson (*Agr. Jour. Cape Good Hope, 20* (*1902*), *No. 13, pp. 754–763*).—A report is made upon an outbreak of so-called redwater in Southern Rhodesia. The clinical symptoms and post-mortem appearance of the animals are critically described, and the disease is said to be identical with Texas fever. The usual treatment is recommended.

Distomatosis—"The cattle scourge of Connaught," J. Watson (*Vet. Jour., n. ser., 5* (*1902*), *No. 27, pp. 145–151*).—An account is given of the local conditions in the County of Connaught, which appeared to favor the continual infestation by liver flukes. Cattle and sheep are extensively affected by liver rot, and the losses are heavy. The County of Connaught possesses a large number of small lakes and ponds, and the rainfall is comparatively heavy. The difficulties in the way of preventing multiplication of the larval forms of the liver fluke are therefore very great.

Sarcoptic mange of the ox, H. Taylor (*Vet. Jour., n. ser., 5* (*1902*), *No. 27, pp. 134–136, fig. 1*).—The author briefly notes the rare cases which have been observed of sarcoptic mange in cattle. Recently 2 cases were observed by the author, each in a dairy near Edinburgh. The question as to whether the mite which causes this disease is identical with that on the horse is left undetermined.

Algerian sheep in France, and sheep pox, Trabut (*Bul. Agr. Algérie et Tunisie, 8* (*1902*), *No. 12, pp. 306–308*).—In this article the author defends the position of the French Government with regard to the regulations issued for the purpose of preventing the introduction of sheep pox from Algeria into France. Many objections have been raised against the regulations, and it has been argued that the latter were calculated to introduce rather than prevent the introduction of sheep pox. These arguments are declared to be without foundation.

Demonstration of virulence of blood in sheep affected with pox, F. J. Bosc (*Compt. Rend. Soc. Biol. Paris, 54* (*1902*), *No. 4, pp. 112–114*).—The experiments conducted by the author on this subject indicate that the blood of sheep affected with this disease is virulent during the period immediately preceding eruption, as well as during the eruptive period. The blood of such animals, when inoculated in a pure condition, produces a fatal development of sheep pox in experimental sheep, with the usual symptoms.

The virulence of the lymphatic glands in sheep pox, F. J. Bosc (*Compt. Rend. Soc. Biol. Paris, 54* (*1902*), *No. 14, pp. 462, 463*).—Experiments made on young lambs indicate that the material of the lymphatic glands of sheep affected with pox is virulent and capable of causing subcutaneous tumors with local eruption, but not a generalized eruption over the surface of the body.

External parasites of sheep, F. E. Emery (*Wyoming Sta. Rpt. 1902, pp. 42–45*).—Brief notes are given on the animal parasites which are most frequently observed on sheep, and directions are presented for preparing and applying sheep dips for the destruction of these parasites.

Hog cholera, J. J. Wester (*Tijdschr. Veeartsenijk. Maandblad, 29* (*1902*), *No. 4, pp. 147–174*).—The author outlines in general terms the various forms of hog cholera which occur, classifying these forms according to the organs which are chiefly affected. Notes are given by way of differential diagnosis between hog cholera and swine plague, and the effectiveness of various forms of serum treatment which have been recommended is discussed.

Combating infectious diseases of pigs, A. van Leeuwen (*Tijdschr. Veeartsenijk. Maandblad, 29* (*1902*), *No. 6, pp. 249–254*).—Attention is called to the difficulties in the way of a thorough and effective disinfection of premises after the prevalence of infectious swine diseases. The governmental regulations may require certain methods to be applied and remedies to be used in a given manner, but experience has shown that even the most thorough application of the best disinfecting methods known is not sufficient to destroy all the organisms which may be found in the buildings and yards occupied by hogs, except when the work is done in the most scrupulous manner.

Conference of government veterinarians on inspection of pigs and pig products, W. C. Quinnell et al (*Jour. Dept. Agr. Victoria, 1* (*1902*), *No. 3, pp. 251–255*).—During this conference resolutions were passed for the purpose of regulating the action of inspectors with regard to tuberculosis, actinomycosis, parasitic diseases, and post-mortem changes in pigs. It is recommended that in pig carcasses affected with localized tuberculosis the affected parts only be removed, and the rest of the pork be admitted for sale. It is further recommended that pigs affected with the following diseases in any stage be condemned: Anthrax, hog cholera, septicaemia, and pyemia.

The method of treating hogs affected with the diamond skin disease in abattoirs, Levy (*Ztschr. Fleisch u. Milchhyg., 12* (*1902*), *No. 8, pp. 234–237*).—The author gives a critical review of the opinions of different authors regarding the nature of the diamond skin disease and its connection with swine erysipelas. It is frequently observed that hogs which have been affected with the diamond skin disease are immune to swine erysipelas and vice versa. The diamond skin disease is usually of a light form, while swine erysipelas is fatal in a large proportion of cases. Both are known to be caused by the same bacillus. The author believes that on account of the frequent occurrence of this bacillus in the intestines of healthy hogs the present methods of combating the disease are inefficient.

Combating glanders in the horse, V. Babes (*Ztschr. Hyg. u. Infectionskrank., 39* (*1902*), *No. 2, pp. 217–282, pls. 2*).—The author made an extensive series of experiments which involved the consideration of all the various problems connected with this disease, including the nature of mallein, the mallein reaction, behavior of evidently glanderous horses toward mallein, mallein injections in horses which do not react in a typical manner, glanderous tubercles, the significance of the cessation of mallein reaction, the reaction of horses which are affected with other diseases than glanders, and the influence of mallein upon the glanderous process and upon the organism of the horse.

The results of these experiments may be stated as follows: The toxic substances which are obtained by filtration and precipitation from pure cultures of glanders bacillus in a manner similar to that of the preparation of tuberculin cause a specific reaction in glanderous horses. More than 90 per cent of the 7,000 evidently glanderous horses, more than 30 per cent of the horses which had been in contact with glanderous horses, and only 1 to 2 per cent of horses in herds which were not infected reacted. The specific action of mallein appears with certainty, however, only in rested, well-fed animals without fever. Low fever temperature occurring just previous to the injection or previous reactions do not interfere with the results of later injections, provided that an interval of 8 days occurs between the two injections. The failure of reaction after frequent injections does not indicate a cure of the disease in all cases, since the reaction frequently begins again after a long interval or the disease may break out anew. In animals which react in a typical manner subsequent examination shows either that the animals are manifestly glanderous or that glanderous tubercles are present in the lungs, liver, or spleen. According to the author's investigations these tubercles are usually due to the entrance of the glanders bacillus into the respiratory passages. Miliary or larger tubercles may thus arise in the smallest bronchia and later the intestines may become infected, usually through the medium of the lymphatic glands.

In an infected stable the author found in addition to 1 or 2 manifestly glanderous horses, and about the same number with suspicious symptoms, from 20 to 30 per cent apparently healthy horses which reacted in a typical manner.

On the basis of the author's investigations it is recommended that all manifestly glanderous horses be destroyed; that 2 mallein injections be made with intervals of 1 to 2 weeks; that all horses which have reacted once in a typical manner should be isolated; that the stalls should be thoroughly disinfected, as well as all drinking troughs or vessels or other utensils which could have become infected. It is also recommended that in an infected herd all horses or animals which do not react or which react in a typical manner should be subjected to systematic mallein injections with increasing doses for the period of a month. After the lapse of the second month 2 mallein injections of the ordinary size should be given. Horses which still react in a typical manner should either be killed or, if too numerous or valuable, may be further treated, and after the lapse of another month may be tested again, at which time, if a reaction takes place, they should be destroyed.

Mal de Caderas, O. VOGES (*Ztschr. Hyg. u. Infectionskrank., 39 (1902), No. 3, pp. 323-372, pl. 1*).—The term Mal de Caderas is applied in South America to a disease of horses closely related to the tsetse-fly disease. It is produced by a blood parasite kown as *Trypanosoma equina*. The most conspicuous symptom is a lameness of the posterior extremities, but this symptom is not always present, and the simplest and surest method of diagnosing suspected cases is by inoculation of experimental animals with the blood of suspected horses. The percentage of mortality from this disease is very high, reaching 100 per cent in some herds of horses.

The blood parasite to which the disease is due is described in considerable detail. Inoculation experiments with this parasite show that rats, rabbits, dogs, sheep, goats, guinea pigs, and poultry are susceptible to the disease, while cattle appear to be completely resistant. It is suspected that the blood parasite is carried by a biting insect, probably *Musca brava*, which is said to resemble in appearance the tsetse fly.

Report on a parasitic disease in horses, mules, and carabao in the Philippine Islands, J. J. CARTER (*Vet. Jour., n. ser., 5 (1902), No. 29, pp. 292-294*).—An investigation of a parasitic disease which affects the carabao in the Philippine Islands disclosed the fact that the blood parasite found in these animals is identical with that reported as occurring in horses and mules and is apparently the surra parasite. Experiments have been instituted by the author, and while final results have not been reached, it appears that the disease may be readily transmitted from horses and mules to carabao or vice versa, and that the agent of transmission of the blood parasite is a biting fly closely resembling the tsetse fly. Good evidence was obtained that pastures may become infested from the presence of one diseased animal and that the disease may thus be transmitted to other animals which are allowed in the pasture soon afterwards.

Pink eye, S. WHARAM (*Vet. Jour., n. ser., 5 (1902), No. 28, pp. 210-215*).—This disease is believed by the author to be a form of influenza due to a micro-organism which has not yet been isolated. Among the predisposing causes of the disease, mention is made of low temperature, damp atmosphere, insanitary surroundings, and improper or insufficient food, together with exhaustion from overwork. Notes are given on the symptoms, post-mortem appearances, and usual methods of preventing and treating the disease. Careful and frequent disinfection of the stables is indicated for the purpose of preventing outbreaks of this disease as far as possible.

Tetanus in dogs, Ducourneau and P. Jayles (*Rev. Vet. Toulouse, 27 (1902), No. 1, pp. 1–5, fig. 1*).—The authors present notes on the subject of tetanus in dogs. It is stated that this disease is probably more frequent in dogs than is usually suspected. In one case a dog affected with tetanus received 200 cc. of artificial serum and a few hours later 5 cc. of antitetanus serum. In this case recovery ultimately took place, although the course of the disease was not rapid and was not immediately affected by the serum treatment.

The treatment of tetanus, Tennert (*Ztschr. Veterinärk., 14 (1902), No. 1, pp. 24, 25*).—On account of the apparent immunity of dogs to tetanus an experiment was made in treating a case of tetanus in a horse by injections of carbolized serum from a dog. This treatment, however, gave negative results.

Malaria of dogs, Nocard and Motas (*Ann. Inst. Pasteur, 16 (1902), No. 4, pp. 257–290, pls. 2*).—A general account is given of the symptoms, etiology, and treatment of this disease. Two clinical forms are distinguished; an acute form, which is almost always followed by death within a few days, and a chronic form, which may be followed after several days by recovery. The symptoms of both forms are described in detail. An elaborate description of the blood parasite is given. A number of these organisms were found within the red blood corpuscles, but the larger number are free. The organism, from a morphological standpoint, can hardly be distinguished from that of Texas fever, but it is physiologically distinguished by the fact that apparently it will not develop in any other animal than the dog. All dogs which recover from the natural attacks of the disease or from artificial inoculation are perfectly immune to further attacks. A number of experiments were made in the use of serum obtained from animals which were naturally immune or which had been hyperimmunized. It was found that the serum obtained from such immune animals exercises a destructive effect upon the organisms in the blood. Virulent blood heated to a temperature of 45° C., or more, completely loses its virulence. When heated to a temperature of 44° for periods of 1 hour no effect was apparently produced upon the vitality or virulence of the organism. The same temperature maintained for a period of 1½ hours, however, destroyed the virulence of the blood parasite.

Rabies, M. P. Ravenel (*Pennsylvania Dept. Agr. Rpt. 1901, pt. 1, pp. 511–532, figs. 4*).—The author presents a general account of this disease, including its history, distribution, cause, method of invasion, resisting power of the virus, period of incubation, symptoms, means of diagnosis, and treatment. Statistics are presented showing the results obtained from the application of the Pasteur preventive treatment on 55,000 persons who had been bitten by mad dogs or dogs supposed to be mad.

Distribution of rabies and an experiment in combating it in the government of Moscow, A. Stepanov (*Arch. Vet. Nauk, St. Petersburg, 32 (1902), No. 2, pp. 156–178*).—Statistics are presented showing the distribution of rabies in various domesticated animals and in man in different parts of Russia, and other countries, from 1883 to the present time. The attempt to eradicate the disease in the government of Moscow was only moderately successful, and this result is attributed by the author to the ignorance of the people with regard to the etiology and pathogenesis of this disease.

The reaction of neuroglia to the presence of rabies virus in dogs, Anglade and Chocreaux (*Compt. Rend. Soc. Biol. Paris, 54 (1902), No. 18, pp. 575–577*).—As the result of numerous microscopic examinations for the purpose of determining any constant lesions which might be considered the result of rabies, the authors conclude that the reaction of neuroglia is less rapid in all other diseases than in rabies. In the latter disease the changes in the nervous elements take place very early and are of an acute and generalized nature.

Blackhead in turkeys, C. Curtice (*Rhode Island State Bd. Agr. Rpt. 1901, pp. 287–296, pl. 1*).—The author presents a history of the discovery and investigations concerning the nature of this disease. No satisfactory treatment is known for the disease, and prompt and thorough isolation of all diseased birds is therefore necessary. In cases of extensive outbreaks or persistent occurrence of the disease the author recommends setting turkey eggs under hens, the latter fowls being unsusceptible to the disease.

Notes on the biology of the organism of cyanolophia of domestic fowls, A. Lode (*Centbl. Bakt. u. Par., 1. Abt., 31* (*1902*), *No. 10, Orig., pp. 448–451*).—In the author's previous investigations on this subject it was found impossible to isolate any organism from diseased fluids or tissues of affected fowls. Further experiments were made for the purpose of determining the reaction of the virus of the disease to various chemical and physical agents. It was found that sulphuric acid in a 1 per cent solution was sufficient to sterilize the virus within 10 minutes. Sterilization was also accomplished in the same time by a 2 per cent solution of potash lye, and by chlorid of lime in a 3 per cent solution in 50 per cent alcohol. While the coarser Chamberland and Berkefeld filters did not prevent the passage of the organism, it was found that the filtrate from the finer filters became sterile after allowing it to stand for a week or 10 days. Virus in which other micro-organisms or fungi were allowed to grow, rapidly lost its virulence.

Diphtheria of fowls; vaccination; serotherapy, C. Guérin (*Rev. Vét. Toulouse, 27* (*1902*), *No. 2, pp. 84–97*).—Notes are given on the symptoms of the disease and on the nature and development of the pathogenic organism. A number of experiments were tried in devising a satisfactory treatment for this disease. During these experiments it was found that pigeons were most susceptible of all domesticated birds to the disease. In pigeons the virulence of the organism was increased by successive passages. It was found to be a simple matter to transmit avian diphtheria experimentally to pigeons, either by inoculation of pure cultures, or of diphtheritic material. It was found possible also to produce a complete and lasting immunity by means of injections of attenuated virus into the peritoneum.

Yellow liver, or congenital functional debility in ostrich chicks, D. Hutcheon (*Agr. Jour. Cape Good Hope, 20* (*1902*), *No. 13, pp. 765–768*).—This disease occurs in the form of atrophy of the liver, with fatty degeneration of the liver cells. The abdominal and thoracic cavities usually contain a clear fluid, the musculature is pale, and the cardiac blood appears to be of lighter color and more fluid than usual. The yellow color of the liver appears to be due not to a primary disease of the liver, but to incomplete absorption of the yolk sac at the time of hatching. For preventing this disease the author recommends more careful attention to the kind and quantity of food, and regularity in feeding, together with plenty of exercise and laxative feeding during the first few days after hatching.

A pigeon epizootic caused by an invasion of Heterakis perspicillum, T. Kašparek (*Centbl. Bakt. u. Par., 1. Abt., 31* (*1902*), *No. 6, Orig., pp. 245–247*).—A pigeon raiser imported a pair of birds from England, which later showed signs of a wasting disease, and died. Subsequently, several other birds fell sick, and the most of them also died. An examination of some of these cases showed the presence of large numbers of *H. perspicillum*, which appeared to have been the cause of the disease. This parasite did not infect any other domesticated animal, but was, so far as observations were made, strictly confined to pigeons.

What ails the chickens? F. E. Emery (*Wyoming Sta. Rpt. 1902, pp. 37–39*).—For destroying chicken lice it is recommended that fowls be dipped in a solution of some sheep dip, chloro-naphtholeum, or similar insecticide. It is estimated that from 10 to 12½ gals. will be sufficient for 30 to 50 fowls. The plumage should be thoroughly soaked, while care should be exercised to prevent the solution from gaining entrance to the lungs of the birds. The yards and buildings may be sprayed with the same material, and the whole process should be repeated after 6 or 8 days. Poultry raisers are advised to give a little extra feed at molting time in order to hasten the growth of the new feathers.

Insects as carriers and spreaders of disease, L. O. Howard (*U. S. Dept. Agr. Yearbook 1901, pp. 177–192, figs. 16*).—A brief account is given of the agency of mosquitoes, flies, and other insects and related animals in transmitting malaria, typhoid fever, yellow fever, and other diseases. Attention is called to the difficulties met with in combating these diseases in country localities where the breeding places for flies and mosquitoes are especially favorable. Notes are given on the best measures to be adopted in destroying flies and mosquitoes in various stages, and thus preventing any opportunity of spreading malaria and typhoid.

Insects as factors in the transmission of disease, H. Skinner (*Pennsylvania Dept. Agr. Rpt. 1901, pt. 1, pp. 329–333*).—This paper contains a brief popular account of the agency of insects, particularly mosquitoes and flies, in the transmission of malaria, yellow fever, and typhoid fever.

AGRICULTURAL ENGINEERING.

Utilizing our water supply, A. J. McClatchie (*Arizona Sta. Bul. 43, pp. 59–141, figs. 9*).—This is a discussion of the best means of utilizing the water supply of Arizona, especially that of the Salt River Valley, based largely on investigations at the station (E. S. R., 14, p. 195) on "the amount of water needed by various crops, the returns per acre of land and per acre-foot of water, from the application of a given amount of water, and the best methods of irrigating various crops." The sources, fluctuation, and total and available amounts of the water supply; appropriation, distribution, and duty of the water supply; and means of increasing the available amount and duty of the supply, are discussed.

The watershed of the Salt River covers an area of 12,000 square miles. Its topography and climate are such as to cause great variations in the flow of the streams that drain it, but the average flow of Salt River below the mouth of its largest tributary, the Verde, has been approximately 1,200,000 acre-feet per year during the past 41 years. There are 275,000 acres of land under canal in Salt River Valley. This is more than the total water supply will irrigate. The amount of water actually used for irrigation is less than one-half of the total supply. It is estimated that the water supply at present available would properly irrigate 110,000 acres, which might be safely increased to 160,000 or 180,000 acres by the construction of the proposed Tonto reservoir.

Development and application of water near San Bernardino, Colton, and Riverside, Cal., J. B. Lippincott (*Water Supply and Irrig. Papers, U. S. Geol. Survey, Nos. 59, 60, pp. 141, pls. 11, figs. 14*).—These papers describe the general conditions of water supply in this important and densely populated region, where the value of water for irrigation is very high. The topics discussed are general location and topography, soil, climate, crops, and water supply. Descriptions are given of the streams tributary to the region, the irrigation systems, artesian wells, and pumping plants. "The data are of particular interest because of the developments made during the dry years which culminated in 1890. Every possible expedient was resorted to for economizing or increasing the supply of water; tunnels were driven into the hills, dams were built to bed rock in the canyons, and wells were dug or drilled throughout the valleys. Almost every conceivable device for pumping water has been employed and great ingenuity displayed in bringing water to the orchards and more valuable crops. The details of some of the works and wells have been brought together by Mr. Lippincott, and form an exhibit of results accomplished under conditions where water has great value."

Fourth report of an investigation of the rivers of Ohio as sources of public water supplies, 1901 (*Columbus: Ohio State Board of Health, 1902, pp. 220, charts 57*).—This is reprinted from the fifteenth annual report of the Ohio State Board of Health, pp. 379–603.

Hydrography of the Southern Appalachian Mountain region, H. A. PRESSEY (*Water Supply and Irrig. Papers, U. S. Geol. Survey, Nos. 62, 63, pp. 190, pls. 44*).—This report "is the outcome of systematic measurements of the water supply from this area and of special investigations made in connection with a general inquiry as to the importance of the streams in the development of the country." It contains a discussion of the general features of the region, the drainage basins, and the flow of the various streams of the region.

Some typical reservoirs in the Rocky Mountain States, E. MEAD (*U. S. Dept. Agr. Yearbook 1901, pp. 415–430, pls. 7*).—Accounts are given of a number of typical reservoirs in Colorado and Utah, with special reference to cost of construction and the benefits derived from the use of the stored waters.

The Nile reservoir dam at Assuân, and after, W. WILLCOCKS (*Jour. Khedir. Agr. Soc. and School Agr., 4 (1902), No. 4, pp. 136–160*).

A practical irrigating system, H. M. ALBAUGH (*Ohio Farmer, 101 (1902), No. 22, p. 485, fig. 1*).—A brief account of irrigation plants of S. Preslan and C. H. Thompson used in growing garden truck for the Cleveland market.

Supplementary report on irrigation in Natal, F. V. CORBETT (*Agr. Jour. and Min. Rec., 5 (1902), No. 10, pp. 309–312.*)

How to build small irrigation ditches, C. T. JOHNSTON and J. D. STANNARD (*U. S. Dept. Agr., Farmers' Bul. 158, pp. 28, figs. 9*).—A reprint of an article originally published in the Yearbook of this Department for 1900 (E. S. R., 13, p. 289).

The measurement of water for irrigation, B. P. FLEMING (*Wyoming Sta. Bul. 53, pp. 58–117, figs. 8*).—A nontechnical discussion of the principles of measurement of water and the construction and use of cheap and efficient measuring devices prepared with a view to meeting the numerous requests for information on the subject and to supplement the reports of the station investigations on the duty of water and the moisture requirements of different crops. A digest of the water laws of Wyoming is also given.

Accuracy of stream measurements, E. C. MURPHY (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 64, pp. 99, pls. 4, figs. 30*).—This paper gives the results of investigations into the accuracy of stream measurements as ordinarily conducted by the hydrographers of the U. S. Geological Survey, with special reference to the instruments commonly employed.

Floods and flood warnings, H. C. FRANKENFIELD (*U. S. Dept. Agr. Yearbook 1901, pp. 477–486*).—This is a brief discussion of the factors determining the volume, extent, and duration of floods, the characteristics of the river systems of the Atlantic Coast and the Mississippi Valley with reference to floods, and the government work in forecasting river stages.

Preliminary list of deep borings in the United States. Part II, Nebraska and Wyoming, N. H. DARTON (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 61, pp. 67*).—An account of a continuation of investigations noted elsewhere (E. S. R., 13, p. 1103).

American farm implements, P. MCCONNELL (*Jour. Bath and West. and South. Counties Soc. [England], 4. ser., 12 (1901–2), pp. 18–35, figs. 6*).—A brief account of the principles of construction and use, and the merits of some American (including Canada and the United States) makes of hay rakes, reaping and mowing machines, thrashing machines, chaff cutters, plows, cultivators, seeders, manure spreaders, wagons, horsepowers, and windmills. The author concludes that a large proportion of American implements are "too slim and easily broken" for use in Great Britain, where the crops, the climate, and the soil are very different from those of America, but that the principles of these implements are capable of adoption in that country and often even the implements themselves, with very slight modifications. He urges the importance of wider use of such labor-saving implements.

The American plow for the Russian trade (*Amer. Inventor, 9 (1902), No. 14, pp. 214, 215, figs. 8*).—Illustrated descriptions of the kinds of plows used by Russian farmers.

Hay or straw baling presses, A. J. PERKINS (*Jour. Agr. and Ind. South Australia, 6 (1902), No. 2, pp. 91–96, figs. 7*).—A brief discussion of the work of certain recently introduced continuous baling presses.

Horsepower as indicating work of steam and oil engines, W. R. JAMIESON (*Jour. Agr. and Ind. South Australia, 6 (1902), No. 2, pp. 106, 107*).—A brief explanation of the terms brake horsepower, indicated horsepower, and normal horsepower. The first is said to represent "the useful power of which an engine is capable." The indicated horsepower is about 10 per cent higher, while the normal horsepower is about two-fifths of the brake horsepower.

The modern harvest field (*Country Life [London], 12 (1902), No. 296, pp. 318, 319, figs. 2*).—Mainly a discussion of the use of motors for driving harvesters, plowing the stubble, and other purposes, with brief reference to a petroleum motor recently tried for these purposes in Lincolnshire, England.

On injection motors, L. LECORNU (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 26, pp 1566–1568*).

Proceedings of the Third Annual Good Roads Convention of the Boards of Supervisors of the State of New York (*U. S. Dept. Agr., Public Road Inquiries Bul. 22, pp. 63, pls. 13*).—Proceedings and papers of the convention held at Albany, N. Y., January 28 and 29, 1902. The information contained in this bulletin relates especially to the advantages of the State-aid plan as practiced in New York. Among the papers presented were A Few Practical Suggestions on Road Building, by C. W. Ross; The League of American Wheelmen and the 'Good Roads' Law, by L. H. Washburn; Wide Tires, by F. M. Power; The Press and Good Roads, by A. H. Battey; Relation Between Macadam Roads and Electric Street Railways, by E. P. North, and The Relation of Common Roads to Railroads, by L. M. Haupt.

Pennsylvania's road system, J. HAMILTON (*Pennsylvania Dept. Agr. Rpt. 1901, pt. 1, pp. 554–558*).—A brief account of the improvements that have been made and of the needs of the system.

City roads and pavements suited to cities of moderate size, W. P. JUDSON (*New York: The Engineering News Pub. Co., 1902, pp. 195, figs. 67*).—This is the second revised and enlarged edition of a work first issued several years ago. In this revision special effort has been made to incorporate the latest information with reference particularly to concrete base, block stone, wood, vitrified brick, asphalt, and bituminous pavements, and broken-stone roads.

New covering for roads (*Tradesman, 48 (1902), No. 4, p. 71*).—A brief reference to a report by the United States consul at Rouen calling attention to the use in France of a mixture of blast-furnace slag and tar as a covering for roads. It is claimed by the inventor, who is an Englishman, that when carefully pressed down with heavy rollers the covering renders the surface of the road impervious to water and free from dust.

Road making from the engineer's standpoint, A. W. CAMPBELL (*Pennsylvania Dept. Agr. Rpt. 1901, pt. 1, pp. 428–436*).—A general discussion of this subject.

Road building with convict labor in the Southern States, J. A. HOLMES (*U. S. Dept. Agr. Yearbook 1901, pp. 319–332, pls. 5*).

Government cooperation in object-lesson road work, M. DODGE (*U. S. Dept. Agr. Yearbook 1901, pp. 409–414, pls. 2*).

Mountain roads as a source of revenue, J. W. Abbott (*U. S. Dept. Agr. Yearbook 1901, pp. 527–540, pls. 7*).—The advantages of the construction of good roads through scenic regions are discussed.

The new farm buildings, F. B. Linfield (*Utah Sta. Rpt. 1901, pp. XLII–XLVI, pls. 4, fig. 1*).—The location and construction of a $10,000 cattle barn and a $2,000 sheep barn recently built at the station are briefly described. Other buildings, including a piggery and poultry house, are to be added in time. "In planning the buildings, their arrangement, and location, the aim was to provide a separate building for each class of live stock, with ample storage for all the feed required during the winter season. They were located to give a maximum of sunlight, yet to have them as close together as possible and conveniently grouped."

The pressure of stored grain on the sides of the receptacles containing it, D. N. Golovin (*Izv. Moskov. Selsk. Khoz. Inst.* [*Ann. Inst. Agron. Moscou*], *8* (*1902*), *No. 2, pp. 168–208*).—Investigation of the laws of the pressure of grain on the sides and bottom of the vessels containing it was begun only recently, but a number of publications have appeared on the subject. A summary of their contents is given in the present article.—P. FIREMAN.

Refrigerating machinery; its principles and management, A. R. Leask (*London: Simpkin, Marshall & Co., Ltd., 1901, 2. ed., pp. IX+296, figs. 74*).

Refrigerating and ice-making machinery, A. J. Wallis-Tayler (*London: Crosby Lockwood & Son, 1902, 3. ed. enl., pp. XVIII+376, pls. 2, figs. 103*).

Refrigereration, cold storage, and ice making, A. J. Wallis-Tayler (*London: Crosby Lockwood & Son; New York: D. Van Nostrand Co., 1902, pp. XXXI+654, figs. 361*).

Materials of construction—a treatise for engineers on the strength of engineering materials, J. B. Johnson (*New York: John Wiley & Sons, 1902, 4. ed. enl., pp. 795, ill.*).

MISCELLANEOUS.

Bulletins and annual reports of Arizona Station, H. J. Hall (*Arizona Sta. Index to Vol. I, Buls. 1–25, and Ann. Rpts. 1890–1897, pp. III+16; Vol. II, Buls. 26–32, and Ann. Rpts. 1898–99, pp. 293–306*).—A general index.

Twenty-fifth Annual Report of Connecticut State Station, 1901 (*Connecticut State Sta. Rpt. 1901, pp. XVI*).—These pages accompany Part IV of the report and contain the organization list of the station, a report on the work of the station during the year, and a financial statement for the year ended September 30, 1901.

General index to reports and bulletins, volumes 1 to 20, 1882 to 1901 (*Ohio Sta. Bul. 128, Index Sup., pp. 247–292*).

Eleventh Annual Report of Oklahoma Station, 1902 (*Oklahoma Sta. Rpt. 1902, pp. 14–79*).—This includes a report of the director on the work of the station during the year, a meteorological summary, a financial statement for the fiscal year ended June 30, 1902, and reprints of press bulletins, as follows: Wheat experiments; pasturing wheat; selection of cotton seed; broom corn; Bermuda grass; rape for early spring feed; alfalfa in Oklahoma; feeding wheat; stock feeding; wheat meal, bran, and shorts; rations for fattening steers; feeding cotton-seed products to steers; feeding cotton-seed meal to hogs; a good pear; a good grape; fruit trees; spray apple trees; cultivate trees; fall planting of trees; plant trees and care for them; blackberries in Oklahoma; potato growing; animal parasites; vaccination to prevent blackleg; loco investigations; woolly aphis; borers in soft maples; and protection against plant diseases and insects.

Fourteenth Annual Report of Oregon Station, 1902 (*Oregon Sta. Rpt. 1902, pp. 12, 46–80*).—This includes a financial statement for the fiscal year ended June 30, 1902, a report of the director reviewing the different lines of station work, and departmental reports, parts of which are noted elsewhere.

Twelfth Annual Report of Utah Station, 1901 (*Utah Sta. Rpt. 1901, pp. LIV*).—This contains the organization list of the station, a report of the director reviewing the work of the station during the year and outlining proposed work, departmental reports, a list of bulletins issued by the station, acknowledgments, and a financial statement for the fiscal year ended June 30, 1901. The report of the agronomist reviews the work done during the year, especially in irrigation, culture experiments, and the destruction of dodder. The report of the horticulturist gives a detailed outline of experiments in progress. The report of the irrigation engineer contains observations on seepage and evaporation.

Twelfth Annual Report of Wyoming Station, 1902 (*Wyoming Sta. Rpt. 1902, pp. 63*).—This includes the organization list of the station, a report of the director, abstracts of Bulletins 50–53 of the station issued during the year, reprints of press bulletins noted elsewhere, a list of acknowledgments, a financial statement for the fiscal year ended June 30, 1902, and reports of the heads of departments.

Crop Reporter (*U. S. Dept. Agr., Division of Statistics Crop Reporter, 4 (1902), Nos. 4–6, pp. 8 each*).—These numbers contain reports upon the condition of crops in the different States and Territories on August 1, September 1, and October 1, 1902, and information of a statistical nature concerning particular crops in the United States and crop conditions in foreign countries.

Yearbook of the Department of Agriculture, 1901 (*U. S. Dept. Agr. Yearbook 1901, pp. 846, pls. 90, figs. 52*).—The Yearbook for 1901 has been prepared on the same general plan as in the past. It includes a report of the Secretary, giving a general review of the operations of the Department during the year, 33 miscellaneous articles noted elsewhere, and an appendix containing the usual statistical matter and other information of interest to farmers.

Agriculture in the tropical islands of the United States, O. F. Cook (*U. S. Dept. Agr. Yearbook 1901, pp. 349–368, pls. 6*).—The more important crops that can be successfully grown in the Tropics are mentioned and briefly described, suggestions being given as to their nature, the regions where they are most likely to be successful, and the possibility of their commercial success.

Agricultural investigations in the island possessions of the United States, W. H. Evans (*U. S. Dept. Agr. Yearbook 1901, pp. 503–526*).—A historical review is given of the various attempts that have been made in promoting agricultural investigations and agricultural instruction in Porto Rico, Hawaii, and the Philippine Islands.

The future demand for American cotton, J. L. Watkins (*U. S. Dept. Agr. Yearbook 1901, pp. 193–206*).—The comparative use of cotton, wool, flax, and silk is discussed, and statistics are given on the production and consumption of cotton in different countries.

The cotton-seed industry, C. M. Daugherty (*U. S. Dept. Agr. Yearbook 1901, pp. 285–298*).—This is an account of the growth and present status of the cotton-seed industry in the United States.

Wheat ports of the Pacific Coast, E. S. Holmes (*U. S. Dept. Agr. Yearbook 1901, pp. 567–580, pls. 5*).—The author describes the ports of San Francisco, Portland, Seattle, and Tacoma, and also the grain fleet of the Pacific Coast, and gives statistics on the exports of wheat and flour and on ocean freight rates.

Some problems in the rural common school, A. C. True (*U. S. Dept. Agr. Yearbook 1901, pp. 133–154, pl. 1, figs. 4*).—The author points out some of the weaknesses of the rural common schools in our present system of education and shows how some of these defects are being overcome in a number of States by erecting or utilizing central schools and bringing the children in public conveyances to them, grading up the central school and introducing studies in the curriculum more closely related to the practical business of the farm, securing teachers in sympathy with farm life, making the schools more largely the center of the intellectual life of the community, and by the cooperation of the farmer and his family with the teachers and pupils through institutes and like agencies.

List by titles of publications of the United States Department of Agriculture from 1840 to June, 1901, inclusive, R. B. HANDY and MINNA A. CANNON (*U. S. Dept. Agr., Division of Publications Bul. 6, pp. 216*).

Nature study and life, C. F. HODGE (*London and Boston: Ginn & Co., 1902, pp. 514, pl. 1, figs. 196*).—This is a practical treatise on nature study, the subject being treated from the standpoint of living things. It contains a vast amount of suggestive and useful information regarding domestic animals and native plants, insects, birds, and lower forms of animal life. Much of it has an agricultural and economic bearing. Thus, detailed directions are given for the growing of an apple tree, peach tree, grapevine, etc., from the planting of the seed to the grafting or budding of the plants, and the after treatment as fruit trees. A chapter on our common birds is considered from the standpoint of what birds do, and their value in the community and to farm life is clearly brought out. Most of the insects treated are those directly related to our orchard, garden, and field crops, and to the household. A chapter is given on elemental forestry, and another on flowerless plants, like ferns, mosses, and mushrooms. A final chapter contains suggestions for lessons with plants and animals, suited to the different grades in the school.

NOTES.

California University and Station.—Among some of the most imperative needs of the university, as set forth by President Wheeler in a recent number of *Sunset*, are the establishment of a school of forestry and a university farm, "with full equipment to illustrate all the usual agricultural processes." E. W. Major, a graduate of the University of Minnesota and for several years an assistant in the dairy department of the station, has been appointed instructor in dairy husbandry in the university, and has entered upon his duties. His first task was the organization of the ten weeks' course in dairying, upon which 26 students have entered. W. A. Setchell, professor of botany in the university and botanist to the station, has been granted his sabbatical leave of absence for one year from July 1, 1903. Through a misunderstanding, it was announced in the October number of the *Record* that J. Burtt Davy had resigned his position in the university and station to accept a position in the Bureau of Plant Industry of this Department. It is now learned that Mr. Davy will retain his position of instructor in the university and assistant botanist to the station, but has been granted leave of absence for one year, during which he will carry on studies in economic botany in this Department, with the title of assistant curator.

Colorado College and Station.—S. Arthur Johnson, a graduate of Rutgers College, has been appointed assistant entomologist, vice E. D. Ball, who, as previously noted, has gone to Utah.

Connecticut Storrs Station.—The headquarters of the station have recently been moved from Middletown to Storrs, and hereafter the business of the station will be conducted at the latter place. Its work will be broadened somewhat and developed along the lines of poultry investigations, horticulture, dairying, and soil tillage. E. R. Bennett, a graduate of the Michigan Agricultural College and deputy inspector of orchards in Michigan, has been appointed assistant horticulturist of the station. He will devote his entire time to experiment station work, and will investigate especially matters concerning small fruits and truck gardening. A bacteriological laboratory is being fitted up at Storrs, where investigations will be conducted in dairy and soil bacteriology under the supervision of Dr. H. W. Conn. The staff of the station as at present organized is as follows: L. A. Clinton, acting director and agriculturist; A. G. Gulley, horticulturist; W. O. Atwater, supervisor, nutrition investigations; H. W. Conn, supervisor, dairy bacteriology; C. L. Beach, dairy husbandman; W. A. Stocking, jr., assistant bacteriologist; F. H. Stoneburn, poultryman; E. R. Bennett, assistant horticulturist; H. L. Garrigus, assistant, field experiments; W. M. Esten, laboratory assistant; B F. Koons, consulting entomologist; C. A. Meserve, consulting chemist; E. H. Lehnert, consulting veterinarian; E. A. White, consulting botanist.

Iowa Station.—C. E. Gray, assistant chemist of the station, has resigned to accept the position of chemist of the Continental Creamery Company, Topeka, Kans.

Minnesota Station.—A. G. Ruggles has been appointed assistant entomologist of the station.

NEW YORK CORNELL STATION.—A live-stock judging pavilion is now under construction. The judging room will be 26 by 36 ft., and will greatly facilitate the practical work with animals, and incidentally the building will be available for other uses.

NORTH CAROLINA STATION.—Franklin Sherman, jr., who for some time has been employed as entomologist to the State department of agriculture, has been placed upon the station staff as entomologist. Nineteen head of thoroughbred Aberdeen Angus cattle were purchased in the vicinity of Columbus, Ohio, during the past summer and are now being inoculated by the veterinarian of the station, preparatory to sending out to farmers in different parts of the State for whom the purchases were made. Thirty-nine head of the same breed of cattle were purchased in Missouri the past winter and inoculated against Texas fever. A portion of these animals were also obtained for farmers, the rest being purchased for the use of the station and the State department of agriculture.

PENNSYLVANIA STATION.—Thorne M. Carpenter, recently of the Massachusetts Station, Leonard R. Cook, of Purdue University, and H. L. Wilson, of the University of Virginia, have been appointed assistant chemists of the station, vice M. S. McDowell, C. W. Norris, and N. W. Buckhout, whose resignations have been previously noted.

TENNESSEE STATION.—A new two-story barn, 20 by 48 ft., has just been completed at a cost of about $400. This barn is intended for cattle feeding under the conditions prevailing on farms in Tennessee, and is designed especially for experiments with stock cattle to be fed on cheap rough fodder and a light grain ration, and finished on grass the following summer. The barn contains 4 pens, 12 by 14 ft., calculated to accommodate 4 lots of 4 cattle each, and has ample storage space above for the rough fodders. The pens connect with an open air yard so that the cattle can be turned out in good weather. In a barn previously erected 16 head of cattle will be fed on a heavy grain and silage ration during this winter and finished for the April market. The object of this experiment, and those provided for in the new barn, is to determine whether the farmers of Tennessee should winter feed their cattle and finish them for the spring market, or carry them through the winter on a cheap ration and finish on grass for the autumn market. During the present winter the station will have more than 100 head of beef and dairy cattle, horses, mules, sheep, and swine, on feeding experiments.

U. S. DEPARTMENT OF AGRICULTURE.—A. S. Hitchcock, of the Bureau of Plant Industry, has been spending some time in Europe, studying especially the sand-binding grasses and their management in Holland, Belgium, France, and Germany. He will return about January 1. A. D. Hopkins has returned from an extended trip to Arizona, southern California, northern Idaho, the Puget Sound country, and the Black Hills, where he has been studying the damage done to timber by insects.

MISCELLANEOUS.—During the past season the North Carolina State board of agriculture has continued field experiments at two substations or test farms in the two ends of the coastal-plain section of the State, the tests being with fertilizers, culture methods, rotations, and varieties of corn, cotton, and peanuts; fertilizer tests with bright tobacco, and an experiment in growing Cuban tobacco on bright tobacco soils. Some cooperative work has also been done in testing varieties of corn and cotton which have been found by previous experiments at these farms to give good results, and the work at the farms has been supplemented by laboratory work. A third farm has been established on the red clay land in the Piedmont section, and experimental work will be taken up on this farm next spring. These farms are maintained exclusively with the funds of the State board of agriculture.

H. M. Cottrell, formerly of the Kansas College and Station, is now professor of agriculture in Ruskin College, located at Trenton, Mo. Ruskin College is the central institution of a number of cooperative associations of which Walter Vrooman is the leading spirit. Thomas E. Will, formerly president of the Kansas College, is professor of social science in the same institution.

The annual report of the board of agriculture of Great Britain for 1901-2, just received, shows that the total amount of grants by the board for agricultural education and research was £7,950 (about $38,700). The report indicates that the board of agriculture is being brought into closer touch with the educational work in charge of the county councils. These councils are "evincing an increasing desire to avail themselves of the assistance of the board, in its advisory capacity, in the development of their educational schemes so far as these bear upon agriculture or rural science." The need of such central coordinating influence has been quite apparent. Most of the county councils have now settled down to elaborate the details of the educational schemes which they have initiated. The board has also been associated with the board of education in the preparation of syllabi for use in rural schools and classes. Continuing the policy of the board to establish and develop collegiate centers, a movement is on foot to secure such an agricultural collegiate center for the southwest of England, although it has not yet taken definite form. The expansion of systematic horticultural instruction by the various collegiate centers is mentioned as a prominent feature of the work. This appears to be largely extension work in the form of lectures and demonstrations, visits to gardens, and the furnishing of advice. In the counties of Cumberland and Northumberland fruit stations have also been established which are thought to promise much success. During the year a fine group of educational buildings was completed at the Yorkshire farm of Garforth, and very extensive additions were made to the class rooms, laboratories, and dormitories of the Southeastern Agricultural College at Wye. It is mentioned that in both cases these additional facilities were the result of a demand rather than an anticipated growth. The college at Wye has been formally affiliated with the University of London.

Science states that in consequence of the removal of Prof. D. A. Gilchrist, the head of the agricultural department at Reading College, to a similar position at Durham College, Newcastle, the department has been reorganized, and the following appointments made: To be lecturer in agricultural botany and director of the agricultural department, John Percival, vice principal of the Southeastern Agricultural College at Wye; to be lecturer in the practice of agriculture, J. O. Peet; to be lecturer in dairy farming and dairy bacteriology, C. W. Walker-Tisdale; to be director of the horticultural department, Frederick Keeble, lecturer in botany at University College, Reading; to be lecturer in horticulture and keeper of the gardens, William H. Patterson.

The report of the Nova Scotia School for Horticulture for the year 1901 has just been received. This school is located at Wolfville, and is in charge of Prof. F. C. Sears, formerly connected with the Kansas and Utah stations. The year is reported as in many respects the most successful in the history of the institution. The total attendance of the school was 68 students, 58 of whom were from Nova Scotia, 7 from New Brunswick, and 3 from Prince Edward Island. The school year opens November 1 and closes May 1, and the course covers two years. The work of the school has been encouraged through the passage by the provincial legislature of "an act to encourage horticulture," appropriating $1,000 a year for the establishment in each county of one or more model orchards, with an experimental plat in connection with the School of Horticulture. The execution of this act is in the hands of the provincial secretary of agriculture and the director of the School of Horticulture. Two of the model orchards were established during the year, and the experimental plat at the school was started. "The plan for the model orchards is to make them as far as possible what their name implies, models that may be followed with profit by all growers in the sections where they are established. To this end the most up-to-date methods will be followed in caring for the land, fertilizing, spraying, and pruning.

But besides being models as to methods, it is hoped to make them of use experimentally, and therefore a few trees each of a number of new varieties of fruits will be included in each orchard. Each plantation will include apples, pears, plums, cherries, peaches, apricots, quinces, crab apples, and all kinds of small fruits." On the experimental plat of the school varieties of most of these fruits were set out, together with a long list of ornamental trees and shrubs; and experiments were made in growing a variety of cover crops for orchards. The work of holding "agricultural meetings" has been continued, the report mentioning 23 such meetings during the year which were attended by the principal of the school.

Under the direction of the board of advisers of the faculty and alumni of the New York State College of Forestry, a periodical publication, known as the *Forestry Quarterly*, has appeared. The objects to which this journal is devoted are to aid in the establishment of rational forest management, to offer an organ for the publication of technical papers of interest to professional foresters in America, and, by means of abstracts, to keep the profession in touch with the current literature and forestry movement in the United States.

A new journal on moor culture, entitled *Hedeselskabets Tidsskrift*, has appeared. The journal is to be published monthly by the Moor Society of Aarhus, and is devoted to a discussion of the usual problems met with in the cultivation of swampy areas, including particularly the culture of grasses and other crops which can be raised in such conditions, and reports of fertilizer experiments.

A note in *Nature* states that Lord Curzon, the viceroy of India, has ordered the heads of the veterinary, survey, forest, meteorological, geological, agricultural, and botanical departments of India to form a board of economic inquiry, which shall meet twice annually to formulate a programme and to review past work. The board is also to act as an advisory committee to the Government.

In order to encourage the cultivation of plants grown by children attending the elementary schools, the education board at Barbados, British West Indies, has issued a list of 50 prizes, varying in value from $2 to 25 cents each, to be offered by the Imperial Department of Agriculture at an exhibition to be held at Dodd's Plantation, January 13, 1903. The plants exhibited must be grown and cared for by the exhibitor. As a further means of promoting this work the Imperial Department of Agriculture distributes small packages of vegetable seeds to the different schools.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*

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With the cooperation of the scientific divisions of the Department.

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EXPERIMENT STATION RECORD.

VOL. XIV. JANUARY, 1903. No. 5.

As the representatives of this Office have visited the experiment stations in different parts of the country during the past year they have been deeply impressed with the fact that many of our most successful station officers are being overworked. This is chiefly due to the great variety of services which they are called upon to perform. Teaching, lecturing at farmers' institutes and elsewhere, writing books, compiling bulletins and newspaper articles, corresponding with a large number of persons on a great variety of subjects, attending meetings of associations, agricultural fairs, etc., absorb a large amount of time and energy; and when to these things is added the earnest pursuit of new knowledge by night and by day, with perhaps very little vacation from year to year, the worker either breaks down prematurely or else, as most frequently happens, the character of his work increasingly approximates the level of mediocrity.

A part of the blame for this unfortunate state of things is undoubtedly to be laid to the charge of the workers themselves. Success in one line often tempts men to broaden their operations to cover lines of effort for which they have no special fitness. An itching for popular applause or the fascinations of administrative functions seduce many investigators to neglect their laboratories for the office and the lecture platform. The notion that a man is great according to the multiplicity of his works, rather than their permanent value, is widespread among us. The vast and complicated operations of the leaders of our industrial system are too often taken as a model to be followed as far as possible in our educational and scientific institutions.

To have one's ear constantly to the telephone, to dictate rapidly to a stenographer, to be ever on the move in a limited express train the American scientist seems often to think he is deprived of his rightful privileges if he can not do all these things. To sit down quietly to plan a thorough investigation of a particular problem, and to pursue details of that plan month after month until the solution is gained, is one of the most difficult things to do amid the feverish activity of our modern world.

NOTE.—These notes are from the Annual Report of the Office of Experiment Stations for 1902.

Many men attribute their failure to achieve success as investigators to their environment, when the trouble is really in themselves. Complaints about lack of time and funds and opportunities count for very little when they come from men who are evidently spreading the scope of their operations beyond a reasonable limit, or who can not produce well-conceived and carefully thought out plans of research. When a station worker tells us in one breath that he can not investigate because he is overloaded with teaching, and in the next informs us that his spare time is occupied in the private management of a large farm, or that he is on the lookout for an opening as college president, we can hardly be expected to sympathize with him if he proves a failure as an investigator.

But on the other hand the failure of station officers to reach their highest efficiency as investigators must in very many cases be attributed to the conditions under which they are compelled to work. Without doubt many advantages have accrued to our stations from their union with colleges, but many evils have also befallen them because of the crude condition of these educational institutions.

Too many of our agricultural colleges are even yet in the high-school stage, and the number of class-room periods required of members of their faculties is reckoned on that basis. This condition is aggravated by the recent popularity of these colleges, which has swelled the number of their students beyond their capacity to accommodate, and has thus materially increased the labors of the teaching staff. When to this is added the success of our experiment stations to such an extent that their correspondence and outside calls for assistance have swelled to vast proportions, and the success of the farmers' institutes and other forms of college extension work among farmers, the demands upon many of our station workers have exceeded their powers of physical and mental endurance.

The recent splendid liberality of many of our State legislatures toward the agricultural colleges in provisions for their equipment with buildings and apparatus is most praiseworthy, but even this has, at least temporarily, laid heavier and most distracting burdens on our station workers. Enlarged material equipment and increased numbers of students are, without doubt, putting heavy burdens upon college presidents and boards of management, who must care for these things and provide teachers for the daily routine of college courses. Their task is a most difficult one, and the public needs to have a more intelligent appreciation of its requirements.

It is nevertheless very important that the just claims of the experiment stations to the best services of able investigators should be duly considered and adequately met.

The value of experiment stations as agencies for the improvement of farm practice, and as instruments for the enlargement of the science of agriculture on which the courses in our agricultural schools and colleges are based, is becoming more apparent with each passing year. Theoretically this is more generally acknowledged by the managers of our colleges; but many of them are still urging what they consider valid reasons for refusing to transmute this theory into practice. And our observations of the past year convince us that there has never been a time when it was more necessary to plead on behalf of our successful station workers that they be relieved from onerous and multifold routine duties, in order that their vigor may be long maintained and their best energies be given to experimental research on behalf of agriculture.

More attention should, in our judgment, be given by the managers of our stations to the hours of labor required of, and the seasons of rest afforded and even enforced upon, our successful station workers. After proper training for research has been acquired, the length of the period during which sustained efforts of the highest order are successfully made is a most important factor in the success of the agricultural investigator. What a waste and loss when the man whose early career gives promise of much fruit of research breaks down in middle life, and either dies or lives on in the shadows of mediocrity. Good investigators are exceedingly rare, and it is really the duty of boards of control and college presidents to seek out such men and to guard them carefully against overwork and dissipation of energy.

We plead, therefore, for a broader and deeper study of the human side of our institutions of agricultural research, in order that there may be a richer and more continuous return for the great outlay which our people are making in the hope of benefiting agriculture, and that there may be a greater enriching of the intellectual side of our agricultural colleges, the permanent success of which depends after all very largely on the work of their research departments.

In former reports it has been urged that it is unwise for stations with limited funds to maintain so many different departments that the funds available for the expenses of experiments other than salaries are very small. This we would continue to urge, at the same time recognizing that under existing conditions it is practically essential that even stations having only the Hatch fund for their maintenance shall be divided into several departments. It is therefore all the more desirable that in some way additional funds shall be obtained to enable the stations to conduct their operations on a larger scale.

More funds are also required to enable the stations to engage in experimental inquiries in lines which they have hitherto neglected.

In the important field of agricultural engineering, with the exception of the work done in irrigation in Colorado and in a more limited way in a few other States, the stations have thus far done almost nothing. Though the farmers of the United States are by far the largest users of agricultural machinery of those in any country, the experiment stations have not undertaken any serious studies of such machinery.

When the Hatch Act was passed fifteen years ago it was estimated that the annual value of agricultural products in the United States was three billion dollars, and that thus the annual expenditures for the stations organized under that act would not amount to more than a tax of twenty-five cents on every thousand dollars' worth of agricultural product. The census of 1900 shows that the annual output of our farms now amounts to five billion dollars. It is believed that the experiment stations have had much to do with this increased agricultural production. The funds expended in their maintenance have thus proved to be highly remunerative investments.

Experience has demonstrated that it is a wise policy to invoke the aid of science and expert skill for the extension and improvement of our agriculture. It would be well, therefore, for our people to consider seriously the extension of the operations of the stations on a scale which it is believed would secure wider and more permanent results.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The determination of sulphur and phosphorus in plant substances, C. P. BEISTLE (*Jour. Amer. Chem. Soc., 24 (1902), No. 11, pp. 1093–1100*). Comparative tests of 8 different methods on cotton-seed meal, timothy hay, and egg albumen are reported. The results show that the fusion method with potassium hydroxid and potassium nitrate gave the highest results for sulphur in all three of the substances examined. "The amount of sulphur in the ash of the various samples is so low that it gives no indication of the total amount of sulphur present, showing that the greater portion is driven off by ignition. The sulphur obtained by boiling with potassium hydroxid solution, with subsequent oxidation with chlorin, gave only half the sulphur found by the fusion method. The sulphur found by ignition in the bomb calorimeter is about the same in amount as that found by combustion in a stream of oxygen and absorption of the products of combustion in a hydrochloric acid solution of bromin, but is still considerably less than is obtained by fusion." It was found that special precautions were necessary in order to secure the complete oxidation of the sulphur.

"The fusion method gave slightly more phosphoric acid than the ash in the case of the cotton-seed meal, but practically the same for the timothy hay and egg albumen. This would indicate that in the substances examined, the phosphoric acid was volatile to a very slight extent, if at all. Boiling with potassium hydroxid solution and treating with chlorin gave results so low that this method may be discarded for the analysis of this class of bodies. The phosphoric acid found by ignition in the bomb calorimeter was slightly less than by fusion, and this difference was probably due to mechanical loss of the smaller particles of the glassy slag which contained almost all the phosphoric acid. The amount of phosphoric acid obtained from the hay by boiling with nitrohydrochloric acid was practically the same as found by fusion or incineration. When the cotton-seed meal was treated in this way only about half of the phosphoric acid present was obtained."

Investigations are reported which indicate that this latter fact is possibly due to the phosphoric acid being in organic combination, which is not broken down by boiling with strong nitrohydrochloric acid.

The determination of sulphur and phosphorus in organic materials, H. C. SHERMAN (*Jour. Amer. Chem. Soc., 24 (1902), No. 11, pp. 1100–1109*).—Comparisons of the bomb calorimeter and nitric acid methods (with compressed oxygen), sodium peroxid-hydroxid, for sulphur and the calorimeter, sodium carbonate, and sulphuric acid ammonium nitrate methods for phosphorus, on dried lean beef, milk curd, coagulated white and yolk of eggs, wheat bran, and dried beans are reported. The conclusions reached were as follows:

"For the determination of sulphur the method of combustion in compressed oxygn is preferred. Equally good results were obtained by the hydroxid-peroxid method, but the manipulation is less convenient. The nitric acid method as used gave low results.

"In the determination of phosphorus practically identical results were obtained whether the material was oxidized by combustion in oxygen, by heating with carbonate and nitrate, or by boiling with sulphuric acid and ammonium nitrate. For the analysis of food materials and physiological products the last-mentioned method will probably be found most convenient, especially in laboratories where the Kjeldahl method for nitrogen is largely used.

"In analyzing animal and vegetable materials there is very much greater danger of loss by volatilization of sulphur than of phosphorus."

The estimation of soil acidity and the lime requirements of soils, F. P. Veitch (*Jour. Amer. Chem. Soc., 24 (1902), No. 11, pp. 1120–1128*).—The method proposed is as follows:

"For the preliminary test, to 3 portions of 10 gm. each of the soil in platinum dishes add 50 to 60 cc. of distilled water, and different amounts of standard limewater. For example, to the first 10 cc., to the second 20 cc., and to the third 30 cc. of limewater are added. Dry down at once on the steam bath, transfer to a stoppered Jena flask with 100 cc. of distilled water, allow to stand overnight, with occasional shaking, filter (the filtrate should be clear or but faintly turbid), take 50 cc. in a Jena beaker, add a few drops of phenolphthalein solution, and boil until the appearance of the pink color or, in the case where no color is developed, to a volume of about 5 cc. Then with the 2 portions of treated soil, one of which has been rendered alkaline by the added limewater and the other of which is still acid, as guides, prepare 3 fresh portions of 10 gm. each, and add limewater as before, except that the amount added to a dish differs from that added to another, by only 1 or 2 cc. Dry, allow to stand, filter, and treat exactly as before. The smallest amount of limewater which gives the characteristic pink with phenolphthalein is taken as the acidity equivalent of the soil. From the data thus obtained, the acidity and lime requirements of the soil may be calculated."

The results obtained with this method on a number of samples of soils from different localities are compared with those obtained by Wheeler in field and laboratory experiments on the same soils, but no very definite relation is shown between the lime requirements as indicated by the proposed method and the productive capacity of the soils. The relations of soil acidity to the productive power are discussed, the need of further study of the subject being pointed out.

Tacke's method for determining acidity in peat soils as applied to other soils, M. Gratchev (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 3 (1902), No. 3, pp. 355–365*).—This method (E. S. R., 9., p. 32) is not considered applicable to soils in general.

A short method of determining potash, B. Sjollema (*Chem. Ztg., 26 (1902), No. 85, pp. 1014, 1015*).—The use of barium carbonate and magnesium chlorid to replace barium chlorid in the precipitation of sulphates in case of potash salts is proposed. The carbonate (stirred up in water) is used at the rate of 10 gm. of carbonate to 5 gm. of the potash salt. In case of salts containing considerable amounts of chlorids the use of magnesium chlorid is unnecessary.

The volumetric determination of lime in the presence of salts of iron, aluminum, manganese, magnesium, phosphoric acid, and sulphuric acid, N. Stepanov (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 3 (1902), No. 2, pp. 190–200*).—In the method proposed the lime in 50 cc. of the solution to be examined, corresponding to 2.5 gm. of substance, is precipitated by adding ammonium oxalate in presence of a slight excess of oxalic acid. The precipitate is washed free from oxalic acid, dissolved in 10 per cent hydrochloric acid, and titrated with potassium permanganate solution.

The separation of iron, aluminum, and phosphoric acid from lime, N. Stepanov (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 3 (1902), No. 2, pp. 201–203*).—The results reported show that 2 precipitations with ammonia in presence of acetic acid are not sufficient to entirely free the precipitate from lime.

The precipitation of solid particles in solutions and the mechanical analysis of soils, G. NEFEDOF (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 3 (1902), No. 4, pp. 421–449, figs. 7*).—To secure a rapid and satisfactory separation of the different grades of soil particles in mechanical analysis of soils, the author recommends rubbing up the sample with water in a porcelain mortar with a rubber-covered pestle, stirring the thin paste so obtained in water, and measuring the amount of material falling to the bottom of a long narrow cylinder during successive intervals of time. An apparatus by means of which the successive precipitates may be removed and weighed is described.

On the combustion of nitrogen, R. SALVADORI (*Gaz. Chim. Ital., 30 (1900), II, pp. 389–404; abs. in Bul. Soc. Chim. Paris, 3. ser., 28 (1902), No. 18–19, p. 770*).—Experiments on the oxidation of nitrogen by burning in a mixture of oxygen and hydrogen are reported, which show among other things that within certain limits an increase of pressure and of the proportion of nitrogen in the gaseous mixture increases the production of nitric acid. A high temperature of the gas at the beginning of the operation and a notable excess of oxygen retard the combustion of nitrogen.

The artificial production of nitrates, MAIZIÈRES (*L'Engrais, 17 (1902), Nos. 41, pp. 975, 976; 42, pp. 999, 1000*).—A discussion of this subject apropos of the announcement of the formation of a company to utilize power from Niagara Falls in the production of nitrates from atmospheric nitrogen by the Bradley and Lovejoy process (E. S. R., 14, p. 119).

Determination of lactose in milk, DEGREZ (*Rev. Gén. Lait, 1 (1902), No. 20, pp. 469–474*).—Comparative tests of several methods are reported.

A method for the quantitive estimation of ergot in flour, W. MITLACHER (*Ztschr. Allg. Oesterr. Apoth. Ver., 1902, No. 5, pp. 115–126; abs. in Bot. Centbl., 89 (1902), No. 14, pp. 411, 412*).—Criticises the method of Max Gruber and describes a means for estimation that is claimed to give results less liable to error.

On the cause of the injury of platinum crucibles in analysis of phosphates, W. C. HERAEUS (*Ztschr. Angew. Chem., 15 (1902), No. 37, pp. 917–921*).—Investigations are reported which indicate that in the process of igniting precipitates in platinum crucibles a certain amount of phosphorus may be set free, which then combines with the platinum, to the injury of the crucibles.

Laboratory work, P. BONÂME (*Rap. An. Sta. Agron. [Mauritius], 1901, pp. 9–24*).—A brief summary of the chemical work of the Agronomic Station of Mauritius on fertilizers, soils, sugar cane and its products, and miscellaneous materials.

Directions for laboratory work in physiological chemistry, H. C. JACKSON (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd., 1902, pp. V+62*).—According to the author, this book was specially designed as a laboratory guide for students in physiological chemistry, especially the medical students in the University and Bellevue Hospital Medical College, New York. The chemical bodies most important from a physiological point are discussed, and a number of experiments are described in considerable detail.

Proceedings of the eighteenth annual convention of the Association of Official Agricultural Chemists (*U. S. Dept. Agr., Bureau of Chemistry Bul. 67, pp. 184*).—This is a detailed report of the proceedings, edited by H. W. Wiley, a summarized account of which has appeared (E. S. R., 13, p. 406).

BOTANY.

Report of the consulting botanist, W. CARRUTHERS (*Jour. Bath and West and Southern Counties Soc. [England], 4. ser., 12 (1901–2), p. 208*).—A brief report is given on several inquiries which were made by the consulting botanist at the request of members of the society. A seed mixture for permanent pasture was prepared, which consisted of timothy, rough-stalked meadow grass, orchard grass, meadow fescue, meadow foxtail, white clover, and yarrow. A number of weeds are reported as overrunning pasture fields, one of the most troublesome of which proved to be a species of Crepis. The spreading habit of the plant prevents the growth of more valuable species, and by its abundant fruit multiplies quite rapidly. It is suggested that its spread may be prevented by cutting when in flower, but where very abundant the pasture should be abandoned and cultivated crops grown for a few years. A brief report is also made of the occurrence of soft brome grass in a wheat field. For some reason the wheat had been crowded out, and four-fifths of the crop is said to be made up of this weed. Since the soft brome grass is an annual, it could be easily eradicated if careful attention be given the subject.

Report of the section of botany, A. Löfgren (*Extr. from Relat. Com. Geogr. e Geol. São Paulo, 1901, pp. 127*).—In addition to the routine report, in which the investigations during the year are briefly described, an appendix is added in which the different varieties of fruit occurring in the botanic garden are enumerated, and an account given of the seed-testing investigations, and descriptions of camphor, esparto grass, ipecac, cassava, jute, perfume plants, and certain species of Acacia and Eucalyptus.

Report of the government botanist, J. H. Maiden (*Agr. Gaz. New South Wales, 13 (1902), No. 5, pp. 499–501*).—A brief report is given of the various investigations undertaken by the author during the year.

Flora of the Galapagos Islands, B. L. Robinson (*Proc. Amer. Acad. Arts and Sci., 38 (1902), No. 4, pp. 77–270, pls. 2*).—A list is given with description of new species of the flora of the Galapagos Islands, the study being based upon the collection secured by the Hopkins-Stanford expedition to those islands. In addition an attempt has been made to summarize all the available information regarding the flora of these islands, and a bibliography of the subject is appended.

The phylogeny of the cotyledon, H. L. Lyon (*Postelsia, the Yearbook of the Minnesota Seaside Station, 1901. St. Paul, 1902, pp. 55–86*).—According to the author, the typical embryo of ferns and angiosperms is differentiated into 3 primary members—the cotyledon, stem, and root. Cotyledons are not arrested leaves, but are primarily haustorial organs. The monocotyledonous condition is the primitive one and prevails in the mosses, ferns, monocotyledons, and some gymnosperms. The 2 or more cotyledons of dicotyledonous plants are jointly the homologue of the single cotyledon of the monocotyledonous plant. The cotyledon always occurs at the base of the primary stem. The hypocotyl is a structure peculiar to the angiosperms, being differentiated between the primary stem and root. The so-called cotyledons of the pteridophytes and gymnosperms, with the possible exception of ginkgo and the Cycads, are true foliage leaves.

Some neglected factors in discussions of heredity, G. J. Peirce (*Abs. in Science, n. ser., 16 (1902), No. 395, p. 137*).—In discussing heredity the author claims that organisms are exposed to certain influences which are constant in their variation and intensity. Among these influences are atmosphere, the earth, water, gravity, etc. These influences can not be escaped nor have they been eliminated in any experiments so far as known, and their importance can only be guessed. The reaction of living organisms to these influences should be considered in all discussions of heredity.

Soil temperatures and vegetation, D. T. MacDougal (*Abs. in Science, n. ser., 16 (1902), No. 395, p. 137*).—A description is given of a method of making observations on soil temperatures by means of the newly designed Hallock thermograph, and the influence of temperatures of soil and air on plant growth was commented upon.

On the distribution of acids in stems, leaves, and flowers, A. Astruc (*Compt. Rend. Acad. Sci. Paris, 133 (1901), No. 13, pp. 491–493; abs. in Bot. Centbl., 89 (1902), No. 16, p. 464*).—An investigation is reported of a score or more genera of plants for the distribution of free or combined acids which exist quite commonly in plants.

The acidity of the stems was found to be diminished from the summit downwards. The acidity of the leaves, which is much greater than that of the stem, is in inverse proportion to the age of the leaves, young leaves being the more acid. Within a given leaf the acidity is greatest near the zone of growth. In the flowers the acidity decreases from the bud to the fully expanded flower. In all the investigations the younger parts were found to possess the greatest acidity.

A simple method for demonstrating the translocation of starch, S. M. Bain (*Univ. Tennessee Record, 5 (1902), No. 4, pp. 259–262, figs. 3*).—While engaged in studies on the effect of fungicides on the foliage of peach, plum, etc., the author found that by placing a number of small drops of a 3 per cent solution of copper sulphate upon the mature leaves of plums or peaches, if the leaves are allowed to remain attached to the stem until the dead areas begin to drop out, the translocation of the starch may be shown. The specimens should be put into alcohol on successive days from the time of the application until the dead areas are conspicuous, and examined in cross section under the microscope, using Schulze's solution for staining. It will be noticed that rapid cell division has occurred at the healed margin, and by the application of iodin distinct zones of starch accumulation will be readily discovered.

Testing for mannose, F. H. Storer (*Bul. Bussey Inst., 3 (1902), II, pp. 13–45*).—The author reports the presence of mannan in the trunk of sugar maple trees, especially in the wood of trees which were felled during the winter months. After the formation of the leaves has begun the amount of mannan present rapidly diminishes to a minimum. It is evident from the investigations reported that mannan is stored as a reserve food in the wood of the sugar maple. Negative results were obtained in testing the wood of the gray birch, poplar, and willow for this substance. It was found present in the orange peel, but not in the seeds, and occurs in a small quantity in the tuberous roots of the Jerusalem artichoke in connection with inulin. Mannan was found present as an adjunct to starch in the seeds of the horse chestnut and also in the storage roots of chicory, dandelion, and asparagus. Although the wood of the white pine and Norway spruce contain mannan in abundance, it was almost totally absent from the seeds of these trees. The author believes that in regard to wood of trees, other substances will be found comparable to starch and mannan which serve as reserve food for the production of leaves and new wood in the spring. Detailed directions are given for the testing and identification of this substance.

The effect of acetylene gaslight on plant growth, F. W. Rane (*Abs. in Science, n. ser., 16 (1902), No. 395, p.137*).—According to the author, acetylene gaslight has a marked effect upon plant growth, especially upon plants grown under glass during the winter months. Experiments showed that some plants were more influenced than others by the stimulation of the light.

Concerning the specific individuality of the root-tubercle bacteria of leguminous plants and the agricultural significance of the question, H. Buhlert (*Fühling's Landw. Ztg., 51 (1902), Nos. 11, pp. 385–391; 12, pp. 417–427*).—An account is given of experiments in which peas and beans were inoculated with organisms taken from tubercles found on the roots of peas, beans, horse beans, and *Acacia speciosa*. The seeds were sterilized in 0.2 per cent solution of corrosive sublimate and grown in sterilized quartz sand, watered with distilled water, and fertilized with phosphoric acid, kainit, and lime. All the organisms were cultivated in pure cultures which served for inoculation material. The author concludes that all the organisms are forms of *Bacillus radicicola*. The bacteria best adapted to a given species of leguminous plant are those naturally found upon that plant. Inoculation with bacteria is possible within certain limits, and while pure cultures are desirable, yet, on account of the difficulties connected with the obtaining and use of such materials, it will generally be found best in agricultural practice to depend upon soil inoculation.

The fixation of nitrogen by leguminous plants, T. Remy (*Chem. Ztg., 26 (1902), No. 80, pp, 945, 946*).—A brief discussion of some of the principal results of recent investigations on this subject.

Nitrogen assimilation and proteid formation of plants, T. CZAPEK (*Beitr. Chem. Physiol. u. Pathol. Ztschr. Biochem., 1 (1902), pp. 538–560; abs. in Bot. Centbl., 89 (1902), No. 18, p. 518*).—Cultures were made with *Aspergillus niger* in solutions containing different forms of nitrogen. The cultures were divided into series in order to compare derivatives of different organic acids, such as the ammoniacal salt, amid, nitril, monamid acid and corresponding amid, the oxyacid ammoniacal salt and its corresponding amid, etc. Sugar was added as required to supply the necessary carbohydrates for the plant. The results obtained showed in each series, as the acetic, proprionic, tartaric, etc.; the amid acid was the most favorable source of nitrogen, followed by the oxyacid ammoniacal salt, while the nitril and monocarbonic acid salt of ammonia were always the poorest. In the albuminoid synthesis of the mold studied the amid acids furnished the best sources of supply. This was best secured when the amount of nitrogen offered corresponded with the percentage found in the albuminoids of the plant.

The germinative power of the conidia of Aspergillus oryzæ, MARY F. HILLER (*Proc. Indiana Acad. Sci., 1901, pp. 272–275*).—A series of experiments is reported upon in which the germination of the conidia of *Aspergillus oryzæ* in different media was tested. It appears that the germinative power of the conidia of this mold is dependent upon the medium upon which the inoculating material is grown. In the experiments conducted the inoculating material varied from 2 years to 4 years and 7 months, and from the results obtained the germinative power seemed to diminish with increased age. Some media were found to be decidedly favorable to the germination of the fungus while others were detrimental. Alcohol was found not to have any stimulating effect upon the conidia. A brief bibliography completes the paper.

The stimulating action of soluble salts of copper on Penicillium glaucum, LE RENARD (*Jour. Bot. [Paris], 16 (1902), No. 3, pp. 97–107; abs. in Bot. Centbl., 89 (1902), No. 24, p. 693*).—The salts of copper in small quantity in certain plant nutrients acts as a stimulus to the growth of some organisms. The stimulative action does not proceed regularly with the increase of the chemical, but is apparently controlled by the media used in the cultures. The stimulating effect is greatest in those media which are the most readily assimilable. Glucose is the medium admitting the greatest excitive action, followed by levulose and gelose. Saccharose, which is ordinarily readily assimilable by the mold experimented with, seems to check the action of the copper salts. The sulphate, chlorid, and nitrate of copper stimulated growth under the conditions of the experiment, but copper acetate was without appreciable effect, the acetate being reduced in the presence of glucose. Copper salts retard germination instead of stimulating it, as in the case of the growth of the mycelium of the fungus.

The resistance of some molds to metallic poisons, C. PULST (*Jahrb. Wiss. Bot. [Pringsheim], 37 (1902), No. 2, pp. 205–263, figs. 2; abs. in Bot. Centbl., 89 (1902), No. 24, p. 684*).—The concentration of metallic salts which molds can withstand when the poisonous compound is added to nutrient media in which the molds are grown varies widely with different organisms. *Mucor mucedo*, *Aspergillus niger*, and *Botrytis cinerea* are capable of enduring only weak solutions, while *Penicillium glaucum* is very resistant. The effect of a salt depends upon the physiological effect of the undissociated part and the concerted action of the kations.

The effect of copper upon *Penicillium glaucum* was so slight as to be unimportant and the fungus underwent such changes in its development that the filaments in contact with the poison were uninjured, although a poisonous quantity was present.

Preliminary notes on some new species of fungi, G. F. ATKINSON (*Jour. Mycol., 8 (1902), No. 63, pp. 110–119*).—Descriptions are given of about 25 new species of basidiomycetous fungi.

The physiology of sea water, R. H. True (*Science, n. ser., 16* (*1902*), *No. 402, p. 433*).—In experiments made under the author's direction at the Woods Hole Marine Biological Laboratory it appeared that a synthetic solution prepared in such a manner as to contain the 6 chief substances present in sea water in the proportion represented differed very markedly in its physiological properties from sea water. Subsequent studies failed to sustain the experiments, and it is clearly indicated that through some error, perhaps due to the insufficient allowance for water present in the salts used, less of these substances was introduced than necessary for making up the solution. Since this correction has been made it has been possible to make synthetically an artificial sea water in which certain marine algæ can develop, and also many very sensitive marine animals may be kept for a considerable time, often carrying out a large part of their development in the artificial mixture.

Catalogue of publications relating to botany in the library of the U. S. Department of Agriculture (*U. S. Dept. Agr., Library Bul. 42, pp. 240*).—An author list and subject index is given to the various books and pamphlets relating to botany in the library of this Department, together with a list of the serial botanical publications.

WATER—SOILS.

A new process for purifying potable water, P. Guichard (*Bul. Soc. Chim. Paris, 3. ser., 27* (*1902*), *No. 18-19, pp. 941-943*).—In the method proposed a slight excess of calcium permanganate is added to the water, and after a sufficient length of time the excess is removed by the addition of iron, the insoluble oxids of iron and manganese formed being removed by filtration. The latter is accomplished by means of a simple form of filter press in which 2 thicknesses of sterilized paper are used.

On the determination of the reducing capacity of natural waters, L. W. Winkler (*Ztschr. Analyt. Chem., 41* (*1902*), *pp. 419-426; abs. in Chem. Centbl., 1902, II, No. 15, p. 958*).—The author reports determinations of the reducing capacity of a large number of samples of water as measured by means of permanganate solution made with a view to determining the limits of reduction for normal waters.

The river irrigating waters of Arizona—their character and effects, R. H. Forbes (*Arizona Sta. Bul. 44, pp. 145-214, figs. 12*).—This bulletin records the results of a systematic study begun in 1899 of the water of the three principal irrigating streams of the Territory—the Salt, the Gila, and the Colorado rivers—and of sundry samples from less important sources.

"With reference to the quality of their waters for irrigation, the rivers of Arizona are very changeable in character, varying in silt and salt content with the nature and condition of the watershed, with the amount and location of rainfall, with climatic effects such as evaporation and temperature, and under the influence of up-river seepage. With reference to the general character of their drainage waters, the watersheds of the Salt, the Gila, and the Colorado rivers may be divided into (1) the mountainous, more forested portions with greater rainfall and better drainage; and (2) the more level, desert portions, receiving less rainfall, and less perfectly drained. . . .

'The mountain flood waters in these rivers are less saline and usually contain less silt than the desert flood waters, which, resulting as a rule from torrential downpours, sweep immense quantities of alkaline salts and erosion sediments into the drainage.

"Low waters in all cases contain higher than the average proportions of salts, partly, especially in summer, because of concentration by evaporation, and largely because of the predominance at such times in these streams of seepage waters, both natural and, in some cases, from up-river irrigation. The amount of sediment in low waters is very small. . . .

"As suggested by the maximum percentages of sediment, the silting up of reservoirs and ditches would be greatest under the Gila River, next greatest under the Colorado, and least under the Salt River, for the years of observation."

The percentages by weight of sediment in the total run-off of the 3 rivers for the year periods of observation were, approximately, in the Gila, 2 per cent; in the Colorado, 0.30 per cent; and in the Salt River, 0.21 per cent; but the sediments in Salt River for this time were much less than normal.

"The sediments of the Colorado are probably in larger part directly erosive in character, coming mainly from the canyon and bad-lands country. The excessive sediments of the Gila are in large part the sweepings from overstocked grazing ranges, and the detritus from valleys whose erosion is the result of overgrazing. The comparatively small amounts of sediments observed in Salt River are in part due to the reservations which protect the upper Salt River watershed. The color, specific gravity, fineness, flocculence, and mineral nature of river sediments are all traceable to watershed conditions. The Colorado is notable (part of the year) for its dense, highly colored sediments and the Gila for its flocculent, more usually black sediments, sometimes exceedingly rich in organic matter. The Salt River sediments more nearly resemble those of the Gila in physical character, but are perceptibly coarser.

"The specific gravities of solid sediments were observed to vary in Salt River from 2.249 to 2.703, averaging 2.604; in the Gila River from 2.580 to 2.766, averaging 2.672; and in the Colorado River from 2.581 to 2.694, averaging 2.652.

"The bulk of mud in flood waters, as compared with that of solid sediments, was observed to vary, after from 10 to 30 days' settling, in Salt River from 5.6 to 7.5 times as great, averaging 6.2 times; in the Gila River from 5 to 8.3 times as great, averaging 6.7 times; and in the Colorado River from 4.5 to 9.5 times as great, averaging 6.2 times. These mud volumes are subject to slow contraction, during long periods of time, amounting to 20 per cent and upward.

"The fertilizing value of these sediments mainly depends upon the nitrogen and organic matter they contain. Potash and phosphoric acid were also estimated, the former being already abundant in our desert soils, and the latter being in slowly available, insoluble form in the river waters. All fertilizing materials are most abundant in time of flood, greatly decreasing at time of low water. . . .

"Under the agricultural conditions which obtain in southern Arizona, it is judged that 100 parts of salts in 100,000 of water, or about 2,700 lbs. per acre-foot, is an objectionable but manageable degree of salinity in an irrigating water. On this basis," Salt River, during 369 days, was above the limit 302 days, below 67; the Gila, during 187 days, was 138 days above, 59 days below; the Colorado River, during 380 days, was 50 days above, 330 days below.

"The character of the soluble salts of the Salt, Gila, and Colorado rivers is usually 'white alkaline' in excess, consisting mainly of chlorids and sulphates of sodium and calcium. The Salt and Gila rivers only, during some but not all floods, have been observed to contain an excess of sodium carbonate, or black alkali, evidently swept into the drainage from overlying watersheds."

The conditions favoring the accumulation of alkali in the surface soil and the control of the rise of alkali and the distribution of the alkaline accumulation by flooding, drainage, and deep and thorough cultivation are briefly explained.

A soil study. IV, The ground water, W. P. HEADDEN (*Colorado Sta. Bul. 72, pp. 47*).—In continuation of previous investigations (E. S. R., 13, p. 830) the author studied the ground water with special reference to soluble salts. Summarizing his results he says that "alkalization in Colorado resolves itself into a question of drainage" and is aggravated by overirrigation.

"Crops growing on alkalized soil with the water table quite near the surface were sensitive to droughty conditions. . . .

"The height of the water plane often changes without sensible cause, probably due to atmospheric conditions, pressure, temperature, etc. Light rains during dry periods produce, as a rule, comparatively great increases in the height of the water plane, probably due to modification of the capillary conditions. Light rains during an interval of abundant moisture when the soil is wet do not produce an increase in the height of the water plane. Moderate rains were sometimes accompanied by temporary depression of the water plane. This was accounted for by the rate of rainfall, character of soil, and the air contained therein. The effect of an irrigating ditch running past the east end of the plat was to raise the height of the water plane by 0.3 ft. at a distance of 142 ft. from the center of the ditch. This rise was apparently produced by the causing of a backward pressure and not by direct infiltration of water. When the water plane rose due to changes in capillary conditions caused by light rainfalls it usually fell to its former level in about 3 days, but when it rose after an irrigation it required from 10 to 13 days for its fall.

"The total solids, salts held in solution in the different well waters, varied both in quantity and in the ratio of the different salts present. Their amount and character depended upon the conditions obtaining in the immediate vicinity of the well. The total solids rose and fell with the water plane, passing into the water as it rose, and remaining in the soil when it fell. . . . The increase in the amount of total solids in a well water is not always the greatest in those wells which show the greatest rise in the water plane, nor in those which usually show the greatest quantities of total solids. The increase in the total solids due to the rise of the water plane seems to be partly dependent upon the rate of diffusion through the soil. . . . The total solids in the well waters were less than in the water in the soil. This difference was not due to a mixture of water entering the wells from different sources, but was seemingly due to the modification of the laws of diffusion and solubility by the soil itself. . . .

"The chlorin, or its corresponding salt, sodium chlorid, was at no time very abundant in the ground water and bore no definite relation to the total solids, as the sodium chlorid ranged from 5 to a little more than 14 per cent of their total weight. The increase or decrease of sodium chlorid, common salt, was not proportional to the increase or decrease of the total solids, and did not serve as an index of either the amount of total solids present or of their variation, except within very wide limits. The chlorin may not always be present in the form of sodium chlorid. . . . Analytical results indicate that it may sometimes be present as magnesium chlorid, and the irregular deportment of chlorin in the waters may be due to such causes, i. e., differences in the manner of its combination. The chlorin present in the ground waters and its variations in quantity throw but little or no light upon the movement of the alkali salts within this soil.

"The term 'total solids' is equivalent to the salts constituting the free solution in the soil. The term represents a different mixture of salts than is found in the incrustations forming on the surface of the soil, or obtained by evaporating an aqueous extract of the soil to dryness. The total solids in the ground water varied greatly in the different wells, and also from time to time, in regard to their quantity, but only to a limited extent in their chemical composition. The difference in the latter respect was almost exclusively confined to the relative quantities of the respective salts. . . .

"The alkali incrustations from this plat consist essentially of sodium and magnesium sulphate in the ratio of two to one. They together constitute 80 per cent of the mass. Calcium sulphate is subordinate in quantity, with sodium chlorid and carbonate still more so.

"The salts dissolved in the ground water, the total solids, consist much more largely of calcium sulphate than of sodium sulphate, and contain about the same amount of magnesium sulphate as the incrustation from this plat. The ratio of calcium sulphate to the magnesium and sodium sulphates in the total solids is approximately 2 : 1¼ : 1. The salts extracted from the first 2 in. of the soil by continued treatment with water consisted of the same salts. They made up nearly 80 per cent of the total, but the ratio was approximately 4 : 2 : 1. The aqueous extract of the second 2 in. of soil contained very little magnesium sulphate, no sodium sulphate, and almost 51 per cent of calcium sulphate. This extract showed a large amount of soluble silicic acid, corresponding to 14.5 per cent of sodium silicate calculated on the dried residue. The upper portions of the ground water are richer in total solids than the successively deeper portions, and the salts in solution differ, especially in their relative quantities.

"There seemed to be an abundant formation of nitric acid in the upper portions of the soil, even in portions of the plat where the alkali salts were abundant. Nitric acid occurred so generally in the ground waters and its variations were so dependent upon other conditions that we can not judge of the effect of the alkalis present nor of that of the mechanical conditions. There was no relation between the amount of total solids and that of the nitric acid present. There was no relation between different wells in regard to the quantity of nitric acid present or its variations. Irrigating the ground increased the nitric acid in the well waters; so did even light rainfalls, probably due to increase of capillary exchange of the nitrates between the upper portions of the soil and the ground water. The ground water from this plat is richer in nitrates than that from neighboring land which is in better condition.

"The nitrites in the ground water are relatively high and are increased by irrigation. This is probably due to the biological conditions of the soil and the deportment of solutions of nitrites toward the soil, especially in regard to the readiness with which they will pass through it.

"The free ammonia and ammonia salts were not especially abundant in the ground water, either before or after irrigation, though more abundant after than before. The ground water was slightly richer in free ammonia than the drain water from this plat. The albuminoid ammonia in the ground water was not excessively high, but it was materially increased by irrigation. The albuminoid ammonia did not appear to pass freely into the drain water.

"The amount of nitrates removed by off-flow water is probably quite limited, as their quantity in the off-flow diminished rapidly."

Alkali, J. D. TINSLEY (*New Mexico Sta. Bul. 42, pp. 31*).—A general discussion of this subject, based on compiled information and on laboratory and field investigations by the author extending over several years. The topics discussed are: Kinds of alkali; composition of alkali in the Pecos Valley; reactions between some of the constituents of alkali; origin of soils and alkali; soil texture, percolation, and capillarity; accumulation of alkali; prevention of the accumulation of alkali; relations of manure to alkali; removal of alkali from the soil; amount of alkali injurious; and summary of conditions in the Roswell and Carlsbad, N. Mex., and Barstow, Tex., districts.

Drainage and flooding for the removal of alkali, J. D. TINSLEY (*New Mexico Sta. Bul. 43, pp. 29, pls. 2*).—About 20 acres of Hondo bottom land near Roswell, N. Mex., was used in these experiments. The soil was very variable, ranging from sandy loam to clay, and consisting largely of sediment deposited by the Hondo River in time of flood. The soil contained so much alkali, almost entirely of the "white" type, that it was suited only to alkali-resistant crops such as saltbushes.

"The drainage system consisted of a main central drain 610 ft. long running from the foot of the slope to the Hondo . . . laid on a grade of 4 in. to the hundred feet. The first 100 ft. from the Hondo is open, the next 270 ft. is laid with 8 in. tile, and the upper 240 ft. with 6 in. tile. . . .

"On the east side of the center there are 12 lateral drains making an angle of about 18 degrees with the main drain, parallel to each other and 155 ft. long. The first 8, from the south, are 30 ft. apart, and laid with 3 in. tile at depths between 2 and 3½ ft.; the next 3 are 40 ft. apart, laid with 4 in. tile, and their depths are from 2½ to 4½ ft., their greatest depth being where they join the main and the least at their east ends, due both to their grade and the slope of the land toward the east. The twelfth drain is 100 ft. from the eleventh, is laid with 5 in. tile and has a mean depth of about 4½ ft.

"On the west side of the main there are 7 drains, each 155 ft. long, and these also make an angle of about 18 degrees with the main. The first 4 are laid with 3 in. tile at a depth of from 3 to 3½ ft., and 60 ft. apart; the next 2 are laid with 4 in. tile at a depth of from 3½ to 4 ft., and 60 ft. apart. The seventh is laid with 5 in. tile at a depth of about 4¾ ft., and is 100 ft. from the sixth. The end of the main drain, where it empties into the river, is about 6½ ft. deep.

"The slope of the land was such as to allow the east end of some of the drains to come within 2 ft. of the surface, while the greatest average depth of any of them was about 5 ft. This gave an opportunity for studying the effect of various depths of water table on the rate of removal of alkali and on the growth of crops."

Observations on the fluctuations in the water table, the discharge of the drains, and alkali content of the soil and drainage water are recorded.

"Where the water table was within 6 in. or less of the surface the amount of alkali was low.

"The maximum effect of capillarity in Hondo meadows soil was found where the water table was about 2 ft. below the surface of the ground, as was shown by the maximum accumulation of alkali.

"Drains less than 3 ft. deep were not effective.

"Ten floodings applied to the natural salt grass-covered surface removed about one-seventh of the total alkali from the first 2 ft. of soil, and carried a large amount of that formerly in the first foot down into the second.

"Seepage water should be cut off by deep drains placed on the side of the land from which it comes.

"Combined open and tile drains will cost from $20 to $30 per acre."

The rôle of the plant in dissolving the plant food of the soil, P. Kossovich (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 3 (1902), No. 2, pp. 145–180, pls. 4, figs. 2*).—Pot experiments with mustard, peas, and flax are reported in detail (both in Russian and in German). The results show that plants play an important part in dissolving plant food of the soil through acid secreted by their roots.

On the influence of calcium carbonate on the progress of decomposition of organic matter, P. Kossovich and I. Tretjakov (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 3 (1902), No. 4, pp. 450–484, fig. 1*).—The literature of the subject is reviewed and experiments in small glass lysimeters are reported which show that the addition of calcium carbonate retarded the decomposition of organic matter (hay and oak leaves). This is stated to be in agreement with the general conclusions of other investigators and with what occurs in nature in the case of chernozem soils on limestone formations. Such soils are rich in humus, while other soils poor in lime do not accumulate large amounts of humus even under forest growth. The close relation between humus and lime content in soils has been pointed out by Hilgard.

The changes in soils which render them productive, A. Krainsky (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 3 (1902), No. 2, pp. 181–189*).—A study of the influence of the addition of various substances to soils on the processes which go on in them—solution of constituents, nitrification, etc.—is briefly reported.

Denitrification in cultivated soil, G. Ampola and C. Ulpiani (*Gaz. Chim. Ital., 31 (1900), I, pp. 185–220; abs. in Bul. Soc. Chim. Paris, 3. ser., 28 (1902), No. 18–19, p. 815*).—Observations on the rate of denitrification in 4 kg. lots of soil containing 30 gm. of nitrate of soda each and inoculated with 10 liters of cultures of denitrifying organisms are reported. After 4 months practically all of the nitrate nitrogen had been set free. It was further observed that calcium nitrate was more resistant to the denitrifying process than potassium and sodium nitrates.

Comparative experiments on the denitrifying organisms of manure, straw, soil, etc., C. Höflich (*Centbl. Bakt. u. Par., 2. Abt., 8 (1902), Nos. 8, pp. 245–248; 9, pp. 273–278; 10, pp. 305–308; 11, pp. 336–339; 12, pp. 361–367; 13, pp. 398–406*).—Culture studies are reported, from which the more important conclusions are that horse manure always contains denitrifying organisms and cow manure generally contains them, the organisms being the same in each manure; the same organisms are found very abundantly in straw; the soil always contains denitrifying organisms of the same kind as are found in manure.

On denitrification, H. Weissenberg (*Centbl. Bakt. u. Par., 2. Abt., 8 (1902), No. 6, pp. 166–170*).—A study of the denitrifying action of *Bacterium pyocyaneum* in culture media under various conditions.

Soil bacteria and the nitrogen question, A. Koch (*Chem. Ztg., 26 (1902), No. 80, p. 945*).—A brief discussion of some of the principal results of recent investigations on this subject.

On the presence of lime as dolomite in certain cultivated soils, T. L. Phipson (*Chem. News, 86 (1902), No. 2234, p. 148*).—Analyses of a number of soils from Argentina are reported which show the presence of about an equal proportion of calcium and magnesium, namely, 1 per cent.

Glacial formations and drainage features of the Erie and Ohio basins, F. Leverett (*U. S. Geol. Survey Monographs, 41 (1902), pp. 802, pls. 26, figs. 8*).—The feature of this exhaustive report of special agricultural interest is the chapter on soils, which discusses the sources of the soil material and classifies and describes the typical soils of the region. These include residuary soils, stony-clay soils, gravelly or stony soils, sandy soils, silty soils, and peaty or organic soils.

The geology of Louisiana, G. D. Harris, A. C. Veatch, and J. A. A. Pacheco (*Louisiana Stas. Spec. Rpt. Geol. and Agr., pt. 6, pp. VI + 288, pls. 44, figs. 27*).—This is a collection of special papers based on the work of 3 field seasons, 1900–1902, continuing that of previous years (E. S. R., 12, p. 221). The subjects reported on are the tertiary geology of the Mississippi embayment, the salines of North Louisiana, the geography and geology of the Sabine River, notes on the geology along the Ouachita, improvements in Louisiana cartography, the subterranean waters of Louisiana, the tides in the Rigolets (by R. A. Harris), and oil in Louisiana. The reports on subterranean waters and on oil are of special interest at this time, the first because of the growth of the rice industry and the consequent increased demand for water for irrigation. The work reported is almost exclusively stratigraphic in character, observations on topography, drainage, soils, etc., not being attempted on account of limited funds.

Science in agriculture (*Farmers' Gaz., 61 (1902), Nos. 1, p. 5; 2, pp. 20, 21*).—A brief review of the work done in different countries in studying and mapping soils.

FERTILIZERS.

The value of barnyard manure, C. E. Thorne and J. F. Hickman (*Ohio Sta. Bul. 134, pp. 89–101*).—The results of tests, on the plan described in a previous bulletin (E. S. R., 12, p. 127), of open yard and stall manure on rotations of corn, oats, wheat, and mixed clover and timothy, and on corn, oats, and wheat grown continuously, are reported. The yard manure "is taken from flat, open yards, where it has accumulated for several months during the fall and winter, and has been subjected to the conditions which affect the ordinary open-yard manure of the average Ohio farm, conditions which involve very considerable losses. For both corn and wheat the manure is applied to the surface as a top-dressing. It is put on with the manure spreader." This manure was used at rates of 4 and 8 tons per acre on each crop in the rotations and 2½ and 5 tons in case of the continuous grain cropping.

In another series of experiments comparative tests were made of open-yard manure treated with fine-ground phosphatic rock, acid phosphate, kainit, and gypsum at the rate of 40 lbs. per ton of manure, and of manure similarly treated, which was "taken from box stalls, where it had accumulated under the feet of animals which were kept continuously in their stalls, being given sufficient bedding to keep them clean without cleaning out the stalls."

The results show in general "that it will pay well to give more attention than is done on the average farm to the preservation of barnyard manure, first, by guarding it from the sources of loss which occur in the ordinary, open barnyard, and, second, by treating it with materials calculated to reduce the losses from escaping ammonia on the one hand and to increase its content of phosphoric acid on the other.

"To accomplish this purpose, acid phosphate appears to be the material producing the largest and most profitable immediate increase in effectiveness of the manure, but the experiments strongly suggest the possibility that the finely ground, phosphatic rock from which acid phosphate is made may be found an economical substitute for the latter by using it as an absorbent in the stables and thus securing an intimate mixture with the manure in its fresh condition."

Aerobic fermentation of barnyard manure, C. Dupont (*Ann. Agron., 28 (1902), No. 6, pp. 289–317*).—Studies of the behavior in different media of *Bacillus mesentericus ruber* and *B. thermophilus grignoni* are reported. These organisms produced carbon dioxid in large quantities and traces of volatile acids. The first is very active above 55° C. and can be cultivated in all media even in absence of nitrogen. It attacks sugar and starch and rapidly breaks down protein with the production of ammonia and the liberation of some free nitrogen. The second can withstand relatively very high temperatures. In its oxidizing action it resembles *B. mesentericus ruber*, but rarely produces ammonia from protein. Barnyard manure is very favorable to the growth of *B. mesentericus ruber*, and at the lower temperatures it soon becomes the predominating organism. When the temperature rises, however, its activity diminishes and it is replaced by *B. thermophilus grignoni*, which will live at a temperature of 70°.

Experiments on the treatment of barnyard manure with lime, O. Reitmair (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 10, pp. 1107–1140*).—The results of the experiments reported indicate that with manure of the kind used in these experiments (mixed solid and liquid manure, with litter, containing 75 per cent of moisture) calcium carbonate is of no value as a preservative.

Field experiments with a fertilizer made from beet-sugar factory refuse, H. Svoboda (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 9, pp. 1036–1052*).—Experiments on a variety of crops during 1900 and 1901 are reported with this fertilizer which is prepared by a patented process consisting essentially of concentrating the diffusion residue to 78 to 80° Brix (1.4 sp. gr.), mixing with powdered calcium carbonate and crude sulphuric acid, and drying. The material is variable in composition, but contains on an average 14 to 15 per cent of lime almost entirely in the form of sulphate, 10 to 14 per cent of potash, 3 to 4½ per cent of nitrogen, and a very small amount of phosphoric acid (about 0.16 per cent).

Chemical-agricultural investigations on "ligara," F. Gabbrielli (*Staz. Sper. Agr. Ital., 35 (1902), No. 8, pp. 642–653*).—The fertilizing value of this material, which is apparently a kind of peat, is discussed.

Contribution to the knowledge of the green manuring of heavy soils, F. Hanusch (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 9, pp. 1063–1066*).—The effect of green manuring with a number of different kinds of plants in comparison with fallow is reported. The results were irregular and did not denote any advantage for the green manuring as regards total crop of oats.

Clover as a fertilizer, W. SAUNDERS (*Canada Cent. Expt. Farm Bul. 40, pp. 23, pls. 2*).—Green manuring with clover as a means of improving soils is discussed.

A study of the cultural value of fertilizers, E. RABATÉ (*Jour. Agr. Prat., n. ser., 4 (1902), No. 42, pp. 497–501*).—The author discusses a number of different ways of estimating the cultural value of fertilizers, and concludes that the simplest and most satisfactory criterion for such estimates is the net profit obtained per unit of area.

The solvent power of different plants for mineral phosphates (*Rev. Gén. Agron. [Louvain], 11 (1902), No. 7–8, pp. 337–341*).—Attention is called to experiments reported by C. Schreiber in 1897, in which this subject was studied with a number of different kinds of plants—11 Gramineæ, 9 Leguminosæ, 3 Cruciferæ, and 8 miscellaneous plants—the solvent power of the plants being distinguished from that of the soil by growing the plants in a soil which was shown to have no solvent power of itself for the phosphates. The Gramineæ showed little solvent power, the greatest being in case of corn; the Leguminosæ utilized the mineral phosphates to a considerable extent; the same was true of the Cruciferæ and buckwheat. The solvent power was very small in case of tobacco and flax, and especially carrots and asparagus; it was slightly greater, but still very small, in case of potatoes and beets. The recent investigations of Prianishnikov (E. S. R., 13, p. 934) are referred to as confirming Schreiber's conclusions, although apparently no account is taken by this investigator of the earlier work.

The phosphate rocks of Arkansas, J. C. BRANNER and J. F. NEWSOM (*Arkansas Sta. Bul. 74, pp. 59–123, figs. 24*).—This is a bulletin of information to encourage the development of the phosphate deposits of Arkansas which occur probably in 3 different regions of the State. The first, and probably the most important, lies in north-central Arkansas, north of Boston Mountains and west of Black River, and includes parts of the counties of Independence, Stone, Izard, Searcy, Marion, Baxter, and Newton; "the second is in the cretaceous area of the southwestern part of the State. It is possible that there is a third north and west of the city of Hot Springs."

The deposits of the first region are being worked by one company for use in the manufacture of acid phosphate, and 2 railway companies are building roads into the region. The phosphate which is now being used "is soft and easily crushed, and in appearance is identical with some of the Tennessee phosphate rocks," and "works up into a dry, friable acid phosphate." The various localities where phosphate has been discovered are described in detail and analyses of 85 samples are reported. The latter show that the phosphates contain a large amount of iron and alumina, the better class containing from 3.08 to 9.01 per cent. The tricalcium phosphate in the better grade of phosphate varies from 49.38 to 76.62 per cent. In the majority of cases the percentage of iron and alumina is too high for the manufacture of high-grade superphosphates. The phosphates are, however, recommended for direct use as a fertilizer in fine-ground condition.

Investigations on the conditions of formation of oceanic salt deposits, especially the Stassfurt salt beds. XXVII, The artificial preparation of Pinnoit, J. H. VAN'T HOFF and G. BRUNI (*Sitzber. Kgl. Preuss. Akad. Wiss. Berlin, 1902, No. 35, pp. 805–807*).—Pinnoit ($MgO.B_2O_3.3H_2O$) which is found in nature as a transformation product of boracite may be prepared artificially by saturating a solution of boric acid (1 part in 10 of water) with magnesium oxid or carbonate in the warm, filtering, and evaporating slowly at 60 to 70° C.

Fertilizer experiments on moor soils in Sweden (*Deut. Landw. Presse, 29 (1902), Nos. 48, p. 413, figs. 2; 49, pp. 420, 421*).—The results of fertilizer experiments on moor soils in progress for 13 years are reviewed.

The after-effect of commercial fertilizers, BACHMANN (*Deut. Landw. Presse, 29 (1902), No. 84, p. 683*).—Experiments are reported in which better returns were obtained from the use of a complete fertilizer each year than when only nitrogen was added the second year and the accumulations of potash and phosphoric acid from previous manurings were depended upon to furnish the required amounts of those constituents.

Analyses of commercial fertilizers, H. J. Wheeler et al. (*Rhode Island Sta. Bul. 85, pp. 179–188*).—This bulletin includes 44 analyses of tankage, bone, fish, and complete fertilizers designed for potatoes and vegetables.

FIELD CROPS.

Silage studies, F. W. Morse (*New Hampshire Sta. Bul. 92, pp. 49–62*). Experiments in progress since 1891 and comprising studies on the composition of corn at different stages of growth and from different quantities of seed per acre, the comparison of varieties for silage and their effect on milk production, and the changes in composition taking place in the silo, are reported and discussed. The results are in some instances compared with those obtained at other stations. The analytical data are given in tables.

It is concluded that the corn plant has reached its maximum food production when it is nearly matured, with the ears fully formed and well filled, and that at this stage it is best suited for silage. The Leaming dent corn was found the most desirable silage variety; and for those portions of the State with too short a season for this variety to reach the proper stage the Sanford flint corn is recommended.

In a feeding test silage made from Sanford, Leaming and Mosby Prolific was compared. Two groups of cows in 1896 and 4 groups in 1897 were fed the different kinds of silage in successive periods of about 3 weeks each. The groups included from 3 to 9 cows each. Judging from the average shrinkage in the yield in milk in passing from one period to another, the results on the whole would seem to place Sanford silage highest and Mosby Prolific lowest in feeding value.

A chemical study of the silage shows that "the sugar in the green fodder is practically all destroyed in the silo, and since it is most abundant in the corn plant in the early stages of ear development, it is an additional argument for postponing cutting until the grain is full size and the sugars have changed largely to starch." The amount of seed per acre affected the yield of green fodder and its composition. The use of 2 bu. of seed produced fodder lacking in protein and containing an increased proportion of fiber. A bushel of seed per acre produced fodder a little inferior in composition to that obtained from the use of ½ bu., but the yield was nearly 50 per cent greater and the total yield of protein and carbohydrates was also increased.

Culture experiments in 1900–1901, A. Damseaux (*Bul. Agr.* [*Brussels*], *18* (*1902*), *No. 1, pp. 9–22*).—The average results of observations made during 16 years show that winter wheat grown after beets yielded 470 kg. of grain and 300 kg. of straw more per hectare than when grown after clover. A comparison of spring and winter wheat for this same period showed that the average yield of winter wheat per hectare was greater by 710 kg. of grain and 830 kg. of straw.

Oats sown broadcast at the rate of 100 kg. per hectare yielded 3,350 kg. of grain and 7,200 kg. of straw as compared with 3,520 kg. of grain and 6,700 kg. of straw per hectare when sown at the rate of 150 kg. Sowing 100 kg. per hectare in drills resulted in a yield of 3,600 kg. of grain and 7,700 kg. of straw, and sowing at the rate of 150 kg. per hectare gave a yield of 4,050 kg. of grain and 6,050 kg. of straw.

The seed of several early varieties of field and sweet corn was obtained from Canada and planted in May. In spite of an unfavorable summer, the grain ripened in September.

Sugar beets grown after clover produced, on an average, for 14 years 312 kg. of sugar more per hectare than where the crop followed winter wheat. The results of variety tests with sugar beets are reported and a rotation and fertilizer application for sugar-beet culture suggested.

The results obtained in fertilizer and culture tests with field beets, abutilon, colza, lupines, and grass are briefly noted.

Influence of the size of seed grains on the yield of grain and straw, F. Lubanski (*Selsk. Khoz. i Lyesov., 200 (1901), Mar., pp. 611–617*).—Experiments were conducted with winter wheat, barley, oats, and sugar beets. The results show that the influence on the yield, and even to some extent on the quality of the crop, was in favor of large seed.—P. FIREMAN.

Results on the experimental fields of Haute Marne (*Semaine Agr., 22 (1902), No. 1080, pp. 28, 29*).—The results of variety and fertilizer tests with wheat, oats, and potatoes are briefly noted, and the management of natural meadows is discussed.

Report of the Agricultural Chemical Experiment Station at Vienna in 1901 (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 3, pp. 415–440*).—Brief notes on fertilizer experiments with wheat, rye, potatoes, and field beets are included in the report.

Report of the Moor Culture Station at Karlshuld, T. Mayer (*Vrtljschr. Bayer. Landw. Rath., 7 (1902), No. 1, pp. 28–43*).—A brief report on the work of the station in 1901, which consisted mainly of culture and variety tests with cereal, root, and forage crops grown on moor soil.

Economic notes on some of the grasses in southwest Missouri, S. A. Hoover (*Missouri State Bd. Agr. Rpt. 1902, pp. 449–456*).—The section of the State is briefly described and short notes on a large number of wild and cultivated grasses are given.

Forage conditions of central Montana, F. A. Spragg (*Montana Sta. Bul. 36, pp. 40, figs. 23*).—This bulletin discusses the geology and physiography of central Montana and describes the natural plant formations in the region, i. e., those localities which through difference of soil moisture and situation produce grasses adapted to the conditions. These localities are known as the bad lands, alkali flats, prairie benches, wet meadows, foothills, and mountain parks. The most common grasses occurring in each region are briefly enumerated. A generic key to the grasses, rushes, and sedges of Montana is published, and an annotated list of the grasses of central Montana, including 76 species, is given.

A preliminary report on the summer ranges of western Nevada sheep, P. B. Kennedy and S. B. Doten (*Nevada Sta. Bul. 51, pp. 57, pls. 26, map 1*).—This bulletin is a report on an investigation of the sheep ranges of the Sierra Nevada within the State. The plants upon which sheep feed, including many grasses and legumes, were collected, and each species is briefly described. The depletion of the ranges for cattle and sheep is considered and methods for range improvement are suggested. The character of the grazing lands is described and notes on the methods of herding sheep and the control of the ranges are given.

Grasses and legumes, C. S. Phelps (*Rhode Island Bd. Agr. Rpt. 1901, pp. 232–254*).—An article treating briefly of the culture and uses of a number of grasses and legumes. The composition and digestibility of the most common hays are discussed and some fertilizer experiments with grasses and legumes are reviewed.

Forage and pasture plants of Iceland, S. Stefánsson and H. G. Söderbaum (*Medd. K. Landtb. Akad. Exptlfält, No. 74, pp. 50, fig. 1*).—After discussing the soil, climate, and flora of Iceland, the following plants are described with reference to their growth, value, and distribution on the island, and their chemical composition: *Aira cæspitosa, Festuca rubra, Poa pratensis, P. glauca, Agrostis vulgaris, Alopecurus geniculatus, Carex cryptocarpa, C. rostrata, C. goodenoughii, Elyna bellardi, Eriophorum polystachium, Scirpus palustris, C. cæspitosus, Juncus filiformis, Triglochin palustre, Salix lanata, Equisetum palustre*, and *E. limosum*.

Cooperative fertilizer tests with grasses and field crops (*Reading Col., Agr. Dept. Rpt. 1901, pp. 1–23, 30, 51–58*).—Tabulated results of fertilizer experiments on hay and pasture lands and with cereal and root crops are reported, with brief comments. Notes on manures and manuring are given.

Grass mixtures for hay and pasture (*Reading Col., Agr. Dept. Rpt. 1901, pp. 23–26*).—The results with 7 different grass mixtures are reported, with brief comments.

Some Australian vegetable fibers, J. H. Maiden (*Agr. Gaz. New South Wales, 13* (*1902*), *No. 2, pp. 167–182*).—A list of indigenous Australian fiber plants is given, together with short descriptions of the different species.

Alfalfa, R. L. Bennett (*Arkansas Sta. Bul. 75, pp. 125-129, fig. 1*).—Brief popular directions for the culture of alfalfa in Arkansas are given.

Alfalfa for Maryland, W. T. L. Taliaferro (*Maryland Sta. Bul. 85, pp. 14*).—This bulletin is a brief popular treatise on the culture and uses of alfalfa. Results of culture and feeding tests with alfalfa made at different experiment stations are reviewed in the text. The culture of alfalfa in Maryland is given special consideration, and the regions presenting the necessary soil requirements for the successful culture of the crop are pointed out.

Alfalfa, Trabut (*Bul. Agr. Algérie et Tunisie, 8* (*1902*), *No. 8, pp. 185–195*).—This article is a concise discussion of alfalfa culture in its different phases, together with a brief history of the plant as a cultivated forage crop.

Experiments with barley in 1902, L. Grandeau (*Jour. Agr. Prat., n. ser., 4* (*1902*), *No. 41, pp. 467–471, figs. 2*).—These experiments, conducted on the experimental fields of the Parc des Princes, consisted of a test of 3 varieties—Hanna, Chevalier-Richardson, and Champagne—and the comparison of 4 different phosphates as fertilizers for barley. Thomas slag was the most effective phosphatic fertilizer and Hanna the most productive variety.

Tests with malting barley (*Reading Col., Agr. Dept. Rpt. 1901, pp. 31–35*).—The results with 6 varieties indicate that some varieties are better adapted to certain localities than others. Five of the varieties were tested simultaneously in different localities. The results are tabulated and briefly discussed.

Buckwheat culture at high altitudes, H. P. Weber (*Amer. Agr.* (*mid. ed.*), *69* (*1902*), *No. 22, p. 724*).—A brief note on the culture of buckwheat in Maryland at an elevation of 1,800 feet above sea level.

Carrots as a forage crop, F. Lubanski (*Selsk. Khoz. i Lyesov., 202* (*1901*), *Sept., pp. 663–672*).—A general article on the best methods of growing carrots for forage purposes.—P. FIREMAN.

Red and striped maize, H. Stewart (*Country Gent., 67* (*1902*), *No. 2559, p. 129*).—This article discusses color variation in the grains of corn. The continuous appearance of red ears, although they are practically never used for seed, is considered as evidence of the natural force of reversion.

Cotton culture in Senegal, Ponty (*Agr. Prat. Pays Chauds, 2* (*1902*), *No. 7, pp. 16, 17*).—A general note on cotton culture in that country. A description of the cotton produced is given.

Cotton culture in Asia Minor, Y. Henry (*Agr. Prat. Pays Chauds, 2* (*1902*), *No. 7, pp. 124, 125*).—Brief notes on cotton culture in Asia Minor, including statements as to soil, climate, varieties, and quality of product.

The cultivation of flax on the Dugin estate (*Selsk. Khoz. i Lyesov., 202* (*1901*), *July, pp. 173-207*).—The estate is situated in the Syckevski district of the Smolensk government, where the cultivation of flax for seed and fiber is comparatively recent. The feature which distinguishes the methods of manipulation of the crop on this estate from those practiced in other parts of the government is careful water retting according to the prevailing systems of Belgium and France. The financial returns are estimated at about $17.50 per acre.—P. FIREMAN.

Experiments with lupines, vetches, and peas for green manuring, O. Pitsch (*Orgaan Ver. Oudleer. Rijks. Landbouwschool, 13* (*1901*), *No. 151, pp. 29–33*).—The experiments were conducted on fertile sandy soil for 2 years. Each year stems, leaves and fruits, and roots were weighed and analyzed. Tables are given showing the weight of dry matter for yellow, white, and blue lupines and for vetches and peas. The results show that the blue lupine gave a greater yield of dry matter and nitrogen than either the white or the yellow. The lupines produced a larger amount of nitrogen and dry matter in the roots and a smaller amount in the stems and leaves than the peas and vetches.—H. M. PIETERS.

Increasing the yield of mangels, A. ARNSTADT (*Hessische Landw. Ztschr.*, *72* (*1902*), *No. 2, pp. 12, 13*).—The results of fertilizer experiments are reported, and the culture of the crop with special reference to increasing the yield is discussed. A number of the best varieties of mangels are briefly described.

Marram grass (*Queensland Agr. Jour.*, *10* (*1902*), *No. 3*, *pp. 205, 206*).—A brief note on marram grass as a sand binder.

Marram grass, A. MOLINEUX (*Jour. Agr. and Ind.*, *South Australia*, *5* (*1902*), *No. 7*, *pp. 604–607*, *figs. 2*).—This article discusses results obtained with marram grass as a sand binder.

Experiments with oats in 1902, L. GRANDEAU (*Jour. Agr. Prat.*, *n. ser.*, *4* (*1902*), *No. 39*, *pp. 403–407*, *figs. 2*).—The results for 1902 of culture and fertilizer experiments with oats in progress on the experiment fields of the Parc des Princes since 1891 are reported. Phosphoric acid was applied in 4 different forms and all produced a large increase in yield, Thomas slag being the most effective. The different varieties grown in this test were Kirsche, Mesdag, and Beseler, yielding 20.86, 20.40, and 16.82 quintals of grain and 47.68, 50.54, and 53.65 quintals of straw per hectare, respectively. The differences in yield due to the fertilizer applications were greater than the differences in yield between the varieties.

Experiments with different phosphates for oats, H. G. SÖDERBAUM (*Medd. K. Landtb. Akad. Exptlfält*, *No. 67*, *pp. 15*, *pl. 1*).—Calcium phosphate, Thomas slag, and superphosphate were compared in pot experiments. The results were largely in favor of Thomas slag and superphosphate and about equal for these 2 substances.

The influence of different temperatures on the growth of roots, A. TOLSKY (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *2* (*1901*), *No. 6*, *pp. 733–744*).—For the purpose of this study oats were grown in soil kept artificially at temperatures of 25 and 8° C., respectively, and compared with plants grown in soil at the natural temperature. In part of the experiment the artificial temperatures were kept up until the first leaves began to unfold, and in the other part until the plants began to tiller. The high temperature caused a quicker germination and growth than the lower temperatures, but produced a small root system. The soil kept at a high temperature produced long and thin roots with few branches, while with the lower temperatures short and thick roots with many branches near the surface of the soil were obtained. From these results the author concludes that for sowing oats a cool soil is preferable to a warm one.

Methods of plant breeding, A. KIRSCHE (*Deut. Landw. Presse*, *29* (*1902*), *No. 3*, *pp. 18, 19*, *figs. 3*).—An account is given of results in plant selection with oats.

Relation of the chemical composition and anatomical character to the value of potato tubers, F. WATERSTRADT and M. WILLNER (*Bl. Gersten-*, *Hopfen- u. Kartoffelbau*, *1901*, *No. 9*, *p. 293*; *abs. in Centbl. Agr. Chem.*, *31* (*1902*), *No. 5*, *pp. 329–331*).—The content of starch, crude fiber, and generally of proteids is considerably higher in the outer layer of fresh potatoes than in the marc, but the content of nonproteid nitrogen is smaller, and the total nitrogen is also usually less. The amounts of proteid nitrogen and starch in the dry matter of both these parts of the tuber do not differ much, but as a rule the marc contains rather more proteids.

The tubers of heavy yielding varieties contain relatively more marc tissues than the tubers of less productive sorts. No relation seems to exist between the feeding value of potatoes and their content of dry matter, starch, and nitrogen, but in the better varieties the relation between starch and total nitrogen is found to be narrow.

Electro-culture of crops (*Agr. Jour. Cape Good Hope, 20 (1902), No. 12, pp. 666, 667*).—The results of experiments in electro-culture with potatoes are reported.

Experiments in storing potatoes, O. APPEL (*Arb. K. Gesundheitsamte, Biol. Abt., 2 (1902), No. 3, p. 373; abs. in Centbl. Bakt. u. Par., 2. Abt., 8 (1902), No. 21, pp. 683, 684*).—Cooperative experiments on storing potatoes by burying them in the ground were made and the results are here summarized. The methods of covering the potatoes are described and the results compared. The development of bacteria on the stored potatoes in some cases killed the eyes or buds.

Report on ramie, E. DAZEY (*Jour. Agr. Trop., 2 (1902), No. 11, pp. 148, 149*).—A brief description of a cheap process of decorticating ramie.

Rice cleaning and polishing, D. C. ROPER (*Twelfth Census United States, Census Bul. 201, pp. 14*).—This is a report on rice cleaning and polishing in the United States and the Hawaiian Islands during 1900. The information presented is largely statistical. Historical and descriptive notes on rice culture are also given.

Rational fertilization of soil seeded to winter rye, S. BOGDANOV (*Selsk. Khoz. i Lyesor., 201 (1901), Apr., pp. 96–116*).—After a survey of the literature on the subject and a discussion of the experimental work of various investigators, the author lays down a plan for the fertilization of soil seeded to rye. If the soil still contains a certain degree of fertility, it is considered unnecessary for the satisfactory development of winter rye to fertilize before winter; but if not fertile enough, a small quantity of a readily assimilable nitrogenous fertilizer should be applied. On light, sandy soils all the necessary fertilizers may be applied in the spring. If the soil is not a sandy one and also when the fertility of the soil is very low so that fertilizer is required before winter, it is recommended to apply the potash and phosphoric acid and only a part of the nitrogen in a slowly assimilable form before sowing. The remainder and larger portion of the nitrogen is to be given in 1 or 2 applications in the spring.—P. FIREMAN.

Notes on sugar-beet culture (*Amer. Agr. (mid. ed.), 69 (1902), No. 10, p. 350*).—An article giving complete details of the production of a prize crop yielding 74,306 lbs. of beets per acre with an average sugar content of 16.1 per cent and a purity of 82.3. The yield of sugar per acre was 11,963 lbs.

Sugar cane report, season 1901, H. J. BLYTH (*Dalsing Serai, India: Indigo Improvements Syndicate, 1902, pp. 3*).—Notes and analyses of different varieties of sugar cane grown in 1901 at the Dalsing Serai Experimental Farm, in the Province of Behar, India.

Sweet potato experiments, C. L. NEWMAN (*Arkansas Sta. Bul. 72, pp. 33–43*).—The results of variety tests with sweet potatoes for the years 1898–1901, inclusive, are given in a table. Of the varieties under test for 4 years, Providence, Southern Queen, Notch Leaf Bunch Yam, Polo, Nancy Hall, Jersey Yellow, and General Grant, given in the order of productiveness, yielded on an average over 200 bu. per acre. Pumpkin, Florida Yam, General Grant, and Southern Queen showed the best keeping qualities. Pumpkin, Vestal New Arkansas Yellow Yam, Florida Yam, General Grant, Nancy Hall, and Tennessee are recommended for their superior table qualities.

Small, medium, and large seed was planted in beds and an equal number of slips from each lot planted on equal areas for comparison. The slips from the large seed yielded 4.8 bu. per acre more than those from the small seed, but the yield of merchantable potatoes was 9.8 bu. greater. "While the results of this test show but a small increased yield from slips from large seed as compared with slips from small seed, it is probable that the progenitors for a number of generations were all small and that the growing of but one crop from large seed went but a short way toward counteracting the influence of heredity."

A comparison for 2 years of vine cuttings and slips for propagation resulted in an average increase of 7.9 bu. of merchantable potatoes and of 4.5 bu. per acre of total yield in favor of vine cuttings. Cuttings 2 ft. long and slips gave practically the same yield, while cuttings 1 ft. long yielded 16.9 bu. of merchantable potatoes and 12.1 bu. of total crop more, and 4.8 bu. of culls less per acre than slips. The results of a test of moving and pruning sweet potato vines to facilitate late cultivation indicate that "any treatment that disturbed the vines, whether by moving, pruning, or lifting, to a more or less extent decreased the merchantable yield, and the time and labor spent in thus manipulating the vines was uselessly employed and probably detrimental to the crop."

For 2 years planting on a level was compared with planting on ridges 3, 6, and 9 in. high. "The highest total yield and the highest yield of merchantable potatoes were secured from the plats with ridges raised 3 in. high. These also gave the smallest number of culls. The next best yield in both merchantable and total product was from the level plats. Ridges 9 in. high gave 28.7 bu. per acre less than the level plats and 33 bu. per acre less than the plat with ridges 3 in. high."

Several lots of sweet potatoes were selected immediately after digging and treated in various ways for the purpose of checking or preventing decay. The percentage of sound potatoes after 10 weeks of storage ranged from 14 to 72. Attempts to store the potatoes within 3 to 5 days after digging or before they were thoroughly dried were all unsuccessful. Sweet potatoes heated for 8 days in a well-ventilated room at a temperature varying from 100 to 130° F. were quite successfully stored in a cellar with the other lots treated in different ways, and the percentage of sound potatoes after 10 weeks of storage ranged from 94 to 98.

Fertilizers for tobacco, B. W. KILGORE (*Bul. North Carolina State Bd. Agr., 23* (*1902*), *No. 3, pp. 34–37*).—In connection with a brief discussion of the subject, 5 different fertilizer formulas suited for different localities are given.

Manufactures of tobacco, J. H. GARBER (*Twelfth Census United States, Census Bul. 197, pp. 36*).—This bulletin contains statistics on the production and manufacture of tobacco and on the imports and exports of the manufactured and unmanufactured article. Historical and descriptive notes on tobacco, its culture and manufacture, are also given.

Vicia augustifolia allioni, L. WITTMACK (*Mitt. Deut. Landw. Gesell., 17* (*1902*), *Nos. 5, pp. 17–19; 6, pp. 25, 26*).—This article treats mainly of the botanical characters of this vetch and the more commonly known species and varieties.

The assimilation of plant food by wheat, J. ADORJÁN (*Jour. Landw., 50* (*1902*), *No. 3, pp. 193–230*).—A review of the work on the assimilation of plant food in wheat is given, and the results obtained by the author in a study along the same line are reported in tables and discussed. Samples of the growing wheat plant taken at intervals of 10 and 5 days were air-dried and analyzed. Analyses are given for the entire plant and for its different parts. The results show that the assimilation of the plant food in wheat does not proceed in the same ratio as the formation of dry matter, but that generally the plant has a greater food requirement in the earlier stages of its growth than later on. During early growth, nitrogen is the principal requirement, and phosphoric acid is also taken up in large quantities. A heavy food requirement continues while the plant is heading. At this time phosphoric acid is needed in large quantities. At the blossom period this element is assimilated even faster than nitrogen and reaches the maximum. Under normal conditions no more phosphoric acid is taken up for the development of the plant after the maximum assimilation has been reached. After blossoming the assimilation of nitrogen is reduced to the needs of the plant for the formation of grain. Wheat takes up the greatest portion of its food in the early stages of growth, stores it up, and draws upon it later for the development of the grain.

Report of the wheat experimentalist, W. FARRER (*Agr. Gaz. New South Wales, 13 (1902), No. 5, pp. 537-542*).—This report describes in a general way the experimental work with wheat carried on at the different experimental farms of New South Wales.

HORTICULTURE.

Cantaloupe culture in Georgia, S. H. FULTON (*Georgia Sta. Bul. 57, pp. 157-193, figs. 11*).—This bulletin discusses Georgia methods of muskmelon culture and gives the results of some cooperative fertilizer experiments with muskmelons. The chief variety grown commercially is the Rockyford, and it is urged that the seed of this variety for planting be selected from the best Colorado-grown stock. Plant early—in South Georgia about the middle of March. Use 10 to 15 seeds per hill and thin to one plant. The following data were obtained in a thinning experiment:

Thinning muskmelon plants.

Plants per hill.	Marketable melons.	Average weight per melon.	Unmarketable melons.
		Pounds.	
One plant	90	1.09	19
Two plants	116	.98	30
Three plants	86	.99	27
Four plants	47	.79	57

While 2 plants per hill gave more marketable melons than 1 plant per hill, the melons were smaller and the percentage of unmarketable melons larger.

Tests of home-grown and Colorado-grown Rockyford seed have resulted in favor of the latter. In the cooperative fertilizer tests the best results were obtained from formulas analyzing 8 per cent phosphoric acid, 7 to 8 per cent potash, and 3 to 4 per cent nitrogen. A formula suggested for South Georgia consists of 1,000 lbs. acid phosphate (14 per cent), 250 lbs. muriate of potash, and 1,000 lbs. cotton-seed meal. From 600 to 800 lbs. of this mixture should be applied per acre 2 to 3 weeks previous to planting and thoroughly worked into the soil.

Detailed notes are given on harvesting, yield, grading, packing, and shipping muskmelons, and on the diseases and insects affecting them. For local market Augusta Market, Anne Arundel, New South, Delmonico, Chicago Market, and Long Island Beauty are considered desirable.

The effects of colored light, L. C. CORBETT (*Amer. Gard., 23 (1902), No. 403, p. 591*).—The author notes the marked stimulating effect of red light on lettuce grown in the greenhouse. The light was used at night and was obtained from an arc light with a colored screen interposed. The use of green or blue lights did not have the same stimulating effect, but were not found harmful. In the experiment cited all the plants under observation received the ordinary daylight, the colored screens being used only at night. In the author's opinion artificial light has a decided forcing value, but hardly sufficient to warrant its use commercially.

A new edible tuber (Coleus coppini), E. HECKEL (*Agr. Gaz. New South Wales, 13 (1902), No. 7, pp. 724, 725*).—It is stated that this tuber is grown in many tropical French colonies as a substitute for potatoes, since in these situations potatoes run to vines. In a lot of these tubers raised in the Colonial Botanical Garden at Marseilles the tubers varied from ½ to 1⅝ in. long and from ¼ to ⅝ in. in thickness. A number of analyses of the tubers showed the following average results: Starch, 14 per cent; fat, 2.5 per cent; glucose, 10.68 per cent; saccharine, 1.67 per cent; gum and pectic matter, 16.05 per cent; albuminous substances, 5.78 per cent; ash, 4.26 per cent; cellulose, ligneous matter, and loss, 40.71 per cent. Directions are given for cooking the tubers; in general this is like potatoes. The plant is believed to be worthy of trial in New South Wales.

Water cress in Erfurt, R. ENGELHARDT (*Möller's Deut. Gart. Ztg., 17 (1902), No. 22, pp. 250-253, figs. 5*).—Cultural account of the water cress industry at Erfurt, Germany.

Experiments in mulching vegetables, R. A. EMERSON (*Twentieth Century Farmer, 1902, No. 69, p. 1, fig. 1*).—Experiments are reported on the use of straw or other similar material as a mulch for garden vegetables. Out of 40 growers that tried the mulch on beans, peas, cabbage, tomatoes, sweet corn, watermelons, muskmelons, cucumbers, and sweet potatoes, 22 report more favorable results than with cultivation; 15 favor cultivation; and with 3, results were about equally favorable to both methods. These results were obtained in Nebraska in an unfavorable year. It is believed that a better showing would have been made for the mulch had the growers practiced cultivation until the ground was thoroughly warm, and then applied the mulch. This practice is recommended.

The value of chemical manures, F. W. E. SHRIVELL (*Jour. Hort., 54 (1902), No. 2784, p. 801*).—In seven years' experiments with garden crops it was shown that the commercial fertilizers could be substituted in part for barnyard manure with a saving in cost.

Report on experiments in fruit and vegetable drying at the experimental garden, Droitwich, 1901, J. UDALE (*Jour. Roy. Hort. Soc. [London], 26 (1902), No. 4, pp. 834-839*).—The percentage product obtained in drying plums, apples, pears, cherries, potatoes, cauliflower, kidney beans, and a number of herbs, with the temperatures used in drying, are recorded. The amount of dried fruit obtained with plums varied from 19 to 33 per cent of the original product. The varieties most suitable for drying were Monarch, Czar, Prince Engelbert, White Perdrigon, and Victoria. The various varieties were dried from 12 to 18 hours. The product in some instances compared favorably with French and California goods. The experiments showed that all kinds of vegetables could be dried successfully, but it was not ascertained whether this could be done with commercial success or not.

The effect of hydrocyanic-acid gas on fresh fruit, H. SCHMIDT (*Arb. K. Gesundheitsamte, 18 (1902), No. 3, pp. 490-517*).—A record is given of some experiments undertaken to determine the effect of hydrocyanic-acid gas on fresh fruits for the purpose of preserving them. The work was undertaken as a result of the report of the German consul from Australia that apples were being preserved for shipment by subjection to the fumes of hydrocyanic-acid gas. The author's experiments showed that such fruits as peaches, plums, apples, pears, and lemons readily absorb this gas and that upon exposure of the fruit to the air part of the gas is given off. A part, however, remains in the fruit apparently in combination with sugar. When the gas was used in sufficient strength to prevent the growth of fungi the color and consistency of the fruit were so changed as to make it unsalable. In any case it appeared to have no preservative effect. When not used in sufficient quantity to destroy the fruit it did not prevent the development of rot. The results of the experiments as a whole go to show that hydrocyanic-acid gas will not prove of special value in the preservation of fresh fruits. The fact that the gas is retained in part in the fruit makes its use dangerous to health.

Fruit growing in New England and its development during the last fifty years, A. LOW (*Trans. Massachusetts Hort. Soc. 1901, I, pp. 92-109*).—This is a discussion of the development of the orchard, small fruit, and grape industries in New England during the last 50 years.

Experiments in orchard culture, C. G. MARSHALL (*Agriculture [Nebraska], 1 (1902), No. 8, pp. 18-20*).—An account is given of experiments made by the horticultural division of the Nebraska Experiment Station to determine the most suitable manner of cultivating orchards in that State. The orchard was divided into 8 sections, one of which was cropped with vegetables, another with corn, and a third with oats. Other plats were cultivated the entire season, cultivated part of the season and then planted to millet, cultivated part of the season and then cropped with oats, and cultivated part of the season and then allowed to run to weeds.

An examination of the moisture content of the soil of the different plats was made during the season and a table is given which shows the number of trees that failed to start into growth and the number of trees that died after starting. The amount of moisture in all the plats remained nearly uniform up to July 1, excepting in the case of the plat cropped with oats for the entire season. On this plat the moisture content was much lower than on any other. On August 15 the plat cultivated to corn contained less moisture than any of the other plats, while the plats cultivated part of the season and then sown to a cover crop contained slightly more moisture than those cultivated throughout the entire season or planted to vegetables. More than 50 per cent of the trees on the plat cropped with oats throughout the entire season failed to start or died after starting. The greatest loss on any other plat was about 20 per cent, and occurred on the plat given cultivation in the early part of the season and then allowed to grow up to weeds.

The results, on the whole, indicate that the sapping of the moisture from the soil in the latter part of the season, as was done by the corn and cover crops, did not have nearly as serious an effect on the trees as did the withdrawal of the moisture by the oat crop in the early part of the season. Another experiment in the cultivation of peach trees showed that cultivation throughout the entire season conduced to more dead trees than cultivation part of the season followed by a cover crop.

Orchard cover crops (*Amer. Agr.* (*mid. ed.*), *69* (*1902*), *No. 3*, *pp. 79*, *100*, *fig. 1*).—A discussion is given of the relative value of various leguminous cover crops for orchards and of some cooperative experiments carried out by the New York Cornell Station with orchardists in different parts of the State. Hairy vetch was one of the most useful plants employed. It is stated that this plant analyzed over 200 lbs. of nitrogen per acre for a growing period of 3½ months. This plant was not very vigorous in the early autumn where the shade was dense, but greatly improved later when the leaves began to fall. One difficulty in connection with the use of this plant is the scarcity of seed. It is stated, however, that if a small quantity is secured in the beginning, the orchardist can easily grow sufficient for his own use each year.

Stringfellow method of planting (*Rural New Yorker*, *61* (*1902*), *No. 2745*, *p. 606*).—A record is given of the growth of apples and grapes planted according to the Stringfellow method a year previous. Out of 132 apple trees planted on the land and given no attention other than a manure mulch, 37 have died. The others have made a ⅛ to ¼ normal growth on the average. Check trees planted with whole roots show 75 per cent of normal growth. With the grapes, 64 out of 153 vines set have died. The others have made from 25 to 40 per cent of a normal growth. A peach orchard of 160 trees planted in the same way is reported as looking thin but most of the trees are still alive. The ground occupied is very poor and difficult to cultivate.

Locating orchards in Washington, S. W. FLETCHER (*Washington Sta. Bul. 51*, *pp. 14*, *figs. 2*).—A popular discussion of the fruit zones of Washington, with suggestions regarding the locating of orchards.

Planting orchards in Washington, S. W. FLETCHER (*Washington Sta. Bul. 52*, *pp. 29*, *figs. 7*).—The best methods for planting orchards in Washington are popularly discussed. In speaking of the Stringfellow system of planting, the author states that the results of the station work in that State indicate no advantage for this method.

Nursery stock for Washington orchards, S. W. FLETCHER (*Washington Sta. Bul. 53*, *pp. 31*).—Popular suggestions to farmers regarding the propagation and buying of nursery stock. A list is appended of the nurseries licensed to sell fruit trees in the State of Washington in 1902.

The commercial apple area, W. A. TAYLOR (*Amer. Gard.*, *23* (*1902*), *No. 404*, *p. 610*).—The author gives statistics from the Twelfth Census which indicate that more than three-fifths of the total number of apple trees grown in this country are found in the North and South Central States. Missouri leads with 20,040,399 trees, followed by New York, Illinois, Ohio, Kansas, Pennsylvania, and Michigan in the order named, the number gradually decreasing from 15,054,832 trees in New York to 10,927,899 trees in Michigan. In the more Northern States the chief commercial varieties grown are Baldwin, Rhode Island Greening, Northern Spy, Tompkins King, Hubbardston, and Russets. Farther south Ben Davis, Winesap, York Imperial, Minkler, Grimes, and Willow Twig are the chief varieties.

Apple growing, pollination, and time of bloom, Maskew (*California Cult., 19 (1902), No. 13, p. 193*).—Some tabulated data are given showing the periods of first bloom, full bloom, and fall of bloom for 16 varieties of apples and 3 varieties of crab apples grown in Los Angeles County, Cal.

Comparing keeping qualities of apples, S. A. Beach (*Amer. Agr. (mid. ed.), 70 (1902), No. 9, pp. 194, 196, 197*).—The average life of 92 varieties of apples kept in a fruit storage house without refrigeration is tabulated. Some of the fruit has been regularly fertilized since 1892 with wood ashes, using 100 lbs. of wood ashes per tree. The data given do not show that the application of the ashes to these trees had any marked influence, one way or the other, on the keeping quality of the fruit. With the Northern Spy, the fruit from orchards in sod was more highly colored and kept better than that from cultivated orchards.

Apple and pear hybrid (*Garden, 61 (1902), No. 1583, p. 199, fig. 1*).—An illustration is given of the fruit of a supposed hybrid between the apple and pear. In general shape the fruit resembles the pear. In taste, however, it is said to resemble the apple.

Varieties of apples and peaches, J. T. Stinson (*Missouri Fruit Sta. Bul. 3, pp. 21–54, pls. 3*).—The author sent letters of inquiry to all the prominent fruit men of the State regarding the best varieties to grow in their respective localities. The replies from 30 of these growers have been tabulated with reference to peaches and apples, and 15 of the more promising varieties of apples are briefly described. The apple oftenest mentioned as most successful in Missouri and placed first as a commercial fruit is Ben Davis, with Gano second. Elberta is mentioned oftenest as the most desirable commercial peach.

The Peen-to peach group, H. H. Hume (*Florida Sta. Bul. 62, pp. 505–519, pls. 3*).—The author states that this group of peaches is essentially adapted to subtropical conditions and particularly the State of Florida. It can also be successfully grown in Louisiana, Mississippi, Alabama, and the coast regions of Texas. It was first grown in Florida in 1869 by J. P. Berckmans from seed obtained from Australia. The trees are characterized as vigorous, upright in habit, prolific, and well covered with foliage. With age the heads become more open and spreading. The fruit is usually roundish in outline and occasionally blunt pointed. They are well colored and of good appearance and flavor. The stones may be either free or cling. The ripening period varies with the different varieties from April to the middle of July. Most varieties mature their fruit by July 1. Twenty-four varieties of these peaches are listed and described. A considerably less number are at present under cultivation. For the southern part of Florida the varieties Angel, Waldo, Bidwell Early, Bidwell Late, Dorothy N., Jewel, Maggie, and Peen-to are recommended; and for the northern part of the State, Angel, Bidwell Late, Jewel, and Waldo. Angel and Waldo are believed to be the most reliable. For the coast region of Texas, Angel, Jewel, and Waldo are recommended.

Orchard results from the sugar prune, C. W. Reed (*Pacific Coast Fruit World, 14 (1902), No. 4, p. 11, fig. 1*).—This prune, originated by Luther Burbank, is now coming into bearing under orchard conditions. It ripens a month earlier than the ordinary French prune, and varies in weight from 6 to 10 per pound green and from 15 to 26 dry. The crop appears to get larger and heavier as the trees get older. Whole fresh fruit analyzed 23.92 per cent sugar. The sugar prune is believed by the author to be superior to the French prune for all fancy and middle grade stocks. The tree has proved a splendid grower on either peach or almond stock.

Olives, G. E. Colby and F. T. Bioletti (*California Sta. Buls. 123 and 137, rev. ed., pp. 45, figs. 9*).—These bulletins have been previously noted (E. S. R., 11, p. 46; 13, p. 747). Methods of olive cultivation, oil making, and pickling, as observed in California, are discussed, and the varieties most commonly grown described, together with the diseases which commonly affect them. A considerable number of analyses with regard to the percentage of oil in the different parts of the fruit, and data as to the number of olives per pound and the proportion of pit to flesh, have been added for a large number of different varieties of olives.

The olive; its culture, oil, and adulteration, L. Cabrié (*Der Olivenbaum, sein Kultur, sein Oel und dessen Fælschungen. Nice: Imprimerie des Alpes-Maritimes, 1901, pp. 38*).—This is a popular discussion of olive culture, including notes on its diseases and directions for the manufacturing and preserving of olive oil. Various chemical tests used to determine the purity of olive oil are also included in the work.

Cultivation, enemies, and commerce of citrus fruits, G. del Viscio (*Coltivazione malattie e commercio degli agrumi. Bari, Italy: Pasquale Losasso, 1900, pp. 176, figs. 36*).—Part 1 of this work includes, under the general heading of culture, notes on botany, propagation, nursery management, soils, climate, irrigation, yields and profits, chemical composition, fertilizing with commercial fertilizers and manures, etc. In part 2, under enemies, are considered the insects and diseases affecting citrus fruits, and climatic conditions. Part 3 is concerned with the production and commerce of citrus fruits.

Trees on sour and Citrus trifoliata stocks, G. L. Taber (*Florida Times-Union and Citizen, 1902, Aug. 8, p. 6*).—In 1899 the author planted an experimental plat of 100 orange and pomelo trees. There were 25 varieties and 4 trees of each variety. Half the trees were worked on sour stock and half on *Citrus trifoliata*. The trees on the sour and on the *C. trifoliata* stock were alternated in the orchard with each other and planted 30 ft. apart each way. At the time of writing (July 26, 1902) the average height of the trees on sour stock was 8 ft. 2 in. and the average breadth 9 ft. 2 in. The average height of the trees on *C. trifoliata* was 6 ft. 2 in. and the average breadth 7 ft. Adding together the fruit produced in 1901 and 1902 and averaging the amount, the trees on sour stock produced a total average of 69 oranges per tree for the 2 years. The trees on the *C. trifoliata* stock have averaged 93 oranges each for the 2 years, an increase of nearly ⅓ over the trees on the sour stock. The fact that the trees on *C. trifoliata* could have been set ¼ to ⅓ closer than the trees on the sour stock and that they might be frozen to the banking 1 year out of 3 and still produce a good crop of fruit 1 year out of 3 is taken as indicating the advantages of this stock for frosty sections. Not all varieties budded on *C. trifoliata* stock gave equally good results. Two varieties of orange, viz, Jaffa and King, and one variety of pomelo, Duncan, have made larger growth on *C. trifoliata* than the corresponding varieties on sour stock planted alongside of them. The following varieties on *C. trifoliata* also compare well as regards growth with those on sour stock: Du Roi, Early Oblong, Homosassa, Madam Vinous, Magnum Bonum, Nonpareil, Pineapple, and Tangerine. Another point brought out in this connection is that while *C. trifoliata* is naturally a much more dwarfed tree than most varieties budded on it, it will nevertheless invariably grow faster than the bud inserted on it. In other words, when the diameter of the bud just above the point of union is perhaps 3 in. the diameter of the *C. trifoliata* stock just below the union will be 3½ in.

The trifoliata down South (*Florida Times-Union and Citizen, 1902, Aug. 22, pp. 5, 6*).—The value of *Citrus trifoliata* stock for adverse situations is discussed and some data given on the productiveness of buds on this stock. A bud 10 in. high of the Oblong Kumquat on this stock ripened 34 good-sized fruits. A bud of the same variety 6 ft. high carried 2,500 fruits. A bud of the Royal Pomelo 5 ft. high matured 44 fruits. A Centennial bud 18 in. high ripened 3 good sized fruits. A number of Buttercourt buds 18 to 24 in. high ripened 9 to 13 fruits. In the opinion of the author, there is a great field for those who wish to grow trees close together, to restrict growth and produce a large amount of fruit on a small area.

Hybrid oranges in Texas, G. Marti (*Florida Times-Union and Citizen, 1902, Aug. 15, p. 6, from Rural New Yorker*).—An account is given by the author of hybridizing *Citrus trifoliata* upon the Satsuma or Oonshiu orange, a hardy, dwarfish variety of the Mandarin kind, thornless, pretty near seedless, and of excellent quality. A number of other crosses were made, but this is the only one the author was able to raise of this parentage. The author states that "the resulting cross took almost every feature of the pollen parent, with its thorns, deciduous triple leaves, and hardy constitution. However, the fruit differs widely from both parents. It is perfectly round, being depressed neither in its blossom nor on its stem end; diameter both ways 2¼ in. It has a roughish but even surface. The color is deep yellow or orange. The rind is extremely thin, merely a skin, but tough, adhering closely to the flesh, which is of a greenish-yellow color. It is very juicy and sweet, having just acid enough to make it sprightly and refreshing and of far better quality than the average California seedling orange. The fruit, however, ripens late—later than that of any of its parents." Considerable difference is noticed between the calyx of the hybrid and that of either parent. On the hybrid the calyx consists of 5 large, foliate, persistent sepals, which keep green and never drop, even when the fruit ripens. The author states that the original tree from which the hybrid fruit was obtained was lost by accident, but that he has 2 healthy grafts growing from it.

A number of other hybrids, mostly crosses of the dwarf type of Mandarin on *C. trifoliata*, have been made. These have bloomed, but all the flowers proved to be without pistils, and many of them proved to be as tender as the orange. A valuable characteristic of the Satsuma hybrid is that it has proved the latest of all to leaf out, even later than its parents. Its chief fault appears to be a lack of the orange aroma in the rind. Instead of this it has a rank odor which is stated to be a characteristic of the average California orange. In the opinion of the author, these experiments have proved that it will be impossible to ever obtain a hardy orange, but "that we can put a highly improved edible fruit on the hardy *C. trifoliata*."

Notes on lemon curing, D. Jones (*Queensland Agr. Jour., 10 (1902), No. 3, pp. 181-183*).—The author states that a successful lemon grower in Victoria cures his lemons by gathering the fruit when it is just turning yellow. The fruit is cut off and a short piece of the stalk left on. It is packed in ordinary cases and stored in a well-ventilated cellar having a temperature of 53 to 57° F. It takes from 7 to 8 weeks to cure lemons, and sometimes longer. When cured, the short piece of stalk left on will drop off when touched. Lemons thus cured keep for 12 months. Oranges are cured in a similar manner, but they must be better colored before cutting than the lemons. They must be handled more carefully and on no account must they be too ripe.

The banana industry in Jamaica, W. Fawcett (*West Indian Bul., 3 (1902), No. 2, pp. 153-170*).—The author describes the banana plant, notes the varieties of bananas grown in Jamaica, and gives in considerable detail the cultural methods observed. The diseases of the banana are also noted and some data given on the cost of growing bananas in Jamaica and the returns obtained.

The cultivation of Japanese kaki (Diospyros kaki), figs (Ficus carica), Punica granatum, and almonds on the southern coast of the Crimea, V. Aggeenko (*Selsk. Khoz. i Lyesov., 202 (1901), Sept., pp. 673–681*).—The author describes the present state of cultivation of these plants in the Crimea and predicts success for their systematic culture.—P. FIREMAN.

Tea, C. A. GUIGON (*Le thé. Paris: Augustin Challamel, 1901, pp. 251, dgms. 2*).—A treatise on the history, culture, and preparation of tea; countries producing it; statistics and commerce of tea; classification of teas; and tea mixtures.

Investigations on the quantity of caffein in several species of coffee trees, G. BERTRAND (*Agr. Prat. Pays Chauds, 2 (1902), No. 8, pp. 211-213*).—A table is given showing the place of origin and the water, ash, nitrogen, and caffein content of 12 samples of *Coffea arabica;* 3 of *C. liberica;* 2 of *C. stenophylla;* and one each of *C. canephora, C. laurina, C. congensis, C. mauritiana, C. humboltiana;* and a variety called Cazengo.

Cacao, culture and preparation, P. PREUSS (*Le cacao, sa culture et sa préparation. Paris: Augustin Challamel, 1902, pp. 127, figs. 69*).—This book is the outcome of a journey in tropical and Central America, and deals particularly with the methods of cacao culture in Trinidad, Guatemala, Venezuela, and tropical and Central America. Buildings used for the drying of cacao are also described and analyses given of the seed of *Theobroma bicolor.*

Contributions to our knowledge of the composition of Norwegian small fruits, A. YSTGAARD (*Tidsskr. Norske Landbr., 9 (1902), No. 3, pp. 125–145*).—A discussion is given on the importance of the fruit industry in Norway, the chemical composition of fruits, and the variations to which the different components are subject, according to time of sampling, latitude of locality where the fruits were grown, etc.

The author does not consider the hypothesis of Schübeler correct, that fruits grown in northern latitudes contain a smaller percentage of sugar than the same kinds grown farther south, that "light produces aroma (flavor), and heat, sugar." So far as the analyses at hand furnish evidence on this point, the data for Norwegian wild or cultivated small fruits do not show a lower sugar content than for the same kinds of fruits grown in the Rhine Valley, for example. Neither does the acidity of fruits grown in the two countries vary regularly, Norway-grown fruits containing sometimes more, sometimes less, acid than those grown in Germany. Direct trials showed that the content of acid has a preponderating influence over that of sugar on the taste and flavor of fruits to such an extent that only 0.1 per cent of acid more than counterbalances 1 per cent of cane sugar.

The following compilation gives the average percentage composition of the different kinds of fruits analyzed by the author, with the range of variation. The acidity of the juice was determined both before and after decoloration with animal charcoal.

Analyses of Norwegian small fruits.

Kinds of fruit.	Number of samples.	Dry matter.	Cellulose.	Pentosans.	Total acidity	Malic acid.	Citric acid.	Sugar.	Albuminoids.	Ash.
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Blueberries	4	[a] 15.30	[a] 3.19	[a] 0.98	0.93	[a] 0.42	[a] 0.02	4.89	[b] 0.50	[a] 0.11
Range		10.9–19.7	1.7–4.7	0.6–1.4	0.55–1.0	0.38–.45	....	3.8– 6.0	....	0.06–.15
Cowberries.....	7	15.48	[b] 1.88	.59	1.92	[c] .31	.64	6.46	[b] .25	[b] .04
Range		14.2–17.6	....	.5– .6	1.8 –2.0	.25–.38	.62–1.3	5.7– 7.0	....	....
Cloudberries...	1	12.02	2.75	1.11	1.05	.50	(d)	2.64	....	.14
Crowberries....	1	10.47	2.07	.93	.32	.16	.02	4.58	....	....
Chokecherries .	1	27.85	6.27	3.70	.66	....	....	2.89	....	.31
Cherries	[illegible]	17.11	....	.27	.90	.23	[e] .09	5.15	....	....
Currants.......		[f] 14.75	[a] 2.57	(g)	2.51	[a] .60	[a] 1.77	3.94	....	....
Range		12.6–16.0	1.9–3.2	....	2.3 –2.7	.4 –.8	1.5 –2.0	3.7– 4.3	....	....
Gooseberries ...	1	10.48	1.17	.57	1.57	.62	[h] .66	5.62	....	....
Raspberries....	7	....	....	....	2.11	....	....	6.38	....	....
Range		....	....	....	1.8 –	....	....	2.4–10.7	....	....

[a] Two samples. [b] One sample. [c] Four samples. [d] "Only a few hundredths of 1 per cent." [e] 0.02 per cent phosphoric acid. [f] Three samples. [g] In one sample, 1.04 per cent pentosans. [h] 0.04 per cent phosphoric acid.

A single sample of raspberries from Nordland contained 18.64 per cent dry matter, 4.09 per cent cellulose, 7.71 per cent pentosans, 5.02 per cent sugar, 1.47 per cent acid in original juice, and 1.52 per cent in decolorized juice, of which 1.40 per cent was citric acid, 0.14 per cent malic acid, and 0.04 per cent phosphoric acid with a trace of sulphuric acid.—F. W. WOLL.

New ideas in strawberry growing, R. M. KELLOGG (*Michigan Farmer; Canad. Hort., 25 (1902), No. 6, pp. 232–234*).—Plants for propagation are grown in hills under the best natural conditions. They are set out in the spring and a scale card kept during the summer as to foliage, vigor, freedom from fungi, size of crown, disposition to throw out runners, and kinds of fruit buds developed. The following spring the plants scoring highest are allowed to fruit. As soon as blossom buds appear about one-half are removed, and when the fruit has set all the berries, except 2 or 3 on each stem, are removed, and the size, color, and firmness of the ripened fruit noted. Plants showing the highest scale are allowed to make runners for the following spring planting. This method of selection is kept up each year.

In the permanent bed, plants are set 30 in. apart in rows 30 to 36 in. apart. The runners are layered so that the plants stand about 10 in. in the row, after which all runners are cut off. It is claimed that berries thus grown are large, of an even size, bright in color, and rich in flavor. The yield is also larger than by any other method tried. Frequent tillage is practiced and irrigation in dry weather.

The sand cherry in cultivation, R. A. EMERSON (*Agriculture [Nebraska], 1 (1902), No. 6, pp. 9–11*).—The author notes the characteristics of the sand cherry and states that a number of hybrids between the sand cherry and various sorts of plums are being grown at the Nebraska Experiment Station. The hybrids have a larger fruit than the sand cherry but the fruit still retains much of the peculiar flavor of the sand cherry. It is hoped that later generations may give something of value. The sand cherry is a shrub growing a foot or two high in the sand hills and 5 to 6 ft. high on rich, moist soils. It is thought that it may be of considerable value in the drier and colder portions of the Northwest, and when further improved may be useful throughout the State.

Grafting green grapevines, J. ZAWODNY (*Gartenflora, 51 (1902), No. 16, pp. 429, 430, figs. 6*).—The grafting of green grapevines has been very successfully practiced by the author. The work is done in May, June, and the beginning of July when the stock is growing most luxuriantly. The graft is made obliquely through a node. The details of the method are clearly brought out in a series of drawings.

Hybridization at Beblenheim, C. OBERLIN (*Troisième Congrès International de Défense contre la Grêle et de l'Hybridation de la Vigne. Lyons: Soc. Rég. Vit., 1902, II, pp. 78–91*).—An account of the work, with a table showing the fertility, maturity, sugar content, and resistance to diseases of the hybrid direct producers grown.

Hybrid direct producers in calcareous soils, J. M. GUILLON (*Troisième Congrès International de Défense contre la Grêle et de l'Hybridation de la Vigne. Lyons: Soc. Rég. Vit., 1902, II, pp. 128–135*).—The general conclusions of the author are practically as follows: Direct producers are in general very resistant to chlorosis. A large number are not sufficiently resistent to phylloxera but may be practically so on deep fresh soils. The yields are generally lower than with grafted vines and the quality of the wine inferior. Nevertheless, several are satisfactory for consumption, for the production of alcohol, and for mixing. While the resistance of direct producers to fungus diseases is rarely complete, nevertheless it is nearly always sufficiently high so that the number of sprayings required by them is considerably less than with grafted vines. The culture of direct producers is recommended only in difficult situations and where it is wished to obtain wine without much expense or trouble. The results obtained up to the present time with direct producers are, on the whole, so promising that their further study should be actively encouraged.

Value of hybrids for wine, J. R. Chevrier (*Troisième Congrès International de Défense contre la Grêle et de l'Hybridation de la Vigne. Lyons: Soc. Rég. Vit., 1902, II, pp. 142–203*).—The value of a large number of hybrids for wine making is discussed and shown in tables of analyses.

The affinity of Vitis vinifera with V. berlandieri, T. V. Munson (*Troisième Congrès International de Défense contre la Grêle et de l'Hybridation de la Vigne. Lyons: Soc. Rég. Vit., 1902, II, pp. 139–142*).—*V. berlandieri*, in the author's experience, has proved one of the most satisfactory stocks for various varieties of *V. vinifera*. It is one of the most resistant species to fungus diseases and phylloxera. It is very resistant to drought.

The effect of phosphoric acid on the quality of wines and on the gray rot, E. Marre (*Prog. Agr. et Vit. (Éd. L'Est), 23 (1902), No. 2, pp. 39, 40*).—In these experiments the vineyard was manured the first year with barnyard manure at the rate of 35,000 kg. per hectare; the second year with superphosphate, 500 kg. per hectare; the third year no manure was given. Since the employment of the superphosphate regularly the vines have been more vigorous and less subject to the "coulure," and there has been an increase in the production of about one-third. The maturity of the grapes on the plats manured with superphosphates has been hastened about 8 days, and the body of the wine increased from 1 to 1½ degrees. The leaves, shoots, and fruits seemed more resistant to fungus diseases. Thus in 1900–1901 it is estimated that 1/10 of the grapes was destroyed by the gray rot on the plats fertilized with barnyard manure, while on the superphosphated plats only about 1/200 was destroyed.

Contribution to the preparation of orchard fruit wines, E. Hotter (*Separate from Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), pp. 63*).—This consists of a discussion of the cider and berry industries in the more important fruit-producing districts of Europe, the characteristics of certain varieties of fruits best suited for cider production, and the results of a number of experiments with different machines for pressing out cider. Both apples and pears are considered; and these are classified and their composition as regards sugar, acid, total extract, etc., is given in a series of tables. The analyses of the wines produced are also tabulated.

Pecans, F. H. Burnette, W. C. Stubbs, and H. A. Morgan (*Louisiana Stas. Bul. 69, 2. ser., pp. 850–884, figs. 19*).—This is a popular discussion of pecan culture in Louisiana, giving methods of propagation, including budding and grafting, and the subsequent treatment to be observed in the nursery and orchard. A number of the better varieties are illustrated and briefly described. The States in which a number of the different varieties originated are also given. Seedling trees planted at the station in 1895 had reached a diameter of 11½ in. and a height of 34 ft. by 1902. The final chapter gives a brief discussion of pecan insects, with suggestions as to the best methods for their control.

The shrubs of Wyoming, E. E. Nelson (*Wyoming Sta. Bul. 54, pp. 47, pls. 5, figs. 16*).—This bulletin has been prepared as an aid in the identification of native shrubs, with the hope that it may be instrumental in interesting the people of the State in the more general planting of shrubs for home decoration. It is stated that most of the cultivated shrubs of the Eastern States will not thrive in Wyoming, especially in the higher altitudes. Brief popular descriptions are given of a large number of different shrubs belonging to 23 different families of plants. The bulletin is indexed with both the Latin and common names of the different shrubs described.

Bulb culture in North Carolina, W. F. Massey (*Amer. Florist, 19 (1902), No. 742, pp. 146–148*).—The author has been growing bulbs experimentally for a number of years in North Carolina, and here summarizes the results of his work. It has been definitely determined that sections about Raleigh, and all that portion of the State known as the lower Piedmont country, east of the Occoneechee, are unsuited to the culture of bulbs except narcissi and the Italian hyacinth. These latter thrive in North Carolina to perfection. Roman hyacinths grow well in North Carolina in cold winters, but in mild winters it is hard to grow them well. Excellent results have regularly been obtained with gladiolus. Cannas have also been grown to a considerable extent. *Sternbergia lutea* does well when planted in August or early September. Guernsey lilies do satisfactorily when planted in August. The spotted-leaf calla is perfectly hardy and commonly planted in the fall. *Arum sanctum* is also perfectly hardy. Excellent results have been obtained in growing *Amaryllis johnsoni.* The author proposes transferring his experimental Bermuda bulbs to the coast plain of the State, where he believes that full success in their culture will be met with. In the author's experiments he has found that while the lily does not tolerate animal manures in contact with the bulbs, commercial fertilizers can be used as heavily as with onions, and the same is practically true of all other bulbs. Narcissi, however, do not object to well-rotted manure, and it is practically as good as commercial fertilizers for hyacinths.

Bulbs in Washington, L. C. CORBETT (*Amer. Gard., 23 (1902), No. 402, pp. 576, 577, figs. 2*).—The author states that Mr. George Gibbs, of New Whatcom, Wash., is now successfully growing the following bulbs: Crocus, narcissus, tulip, hyacinth, and such lilies as *Lilium excelsum, L. album, L. auratum, L. candidum, L. columbianum, L. washingtonianum*, and Longiflorums from Japan and Bermuda. The increase with *L. longiflorum* has been especially satisfactory. One of the chief obstacles to the successful commercial development of the bulb industry on the Pacific Coast seems to be the cost of transportation to the East, freights being considerably greater by rail to the East than by water from the bulb-growing districts of Europe.

An experiment with hyacinths in water, E. E. BOGUE (*Amer. Florist, 19 (1902), No. 749, p. 378*). The details of an experiment undertaken to determine whether the behavior of varieties was due to the variety itself or to the manner of culture. No difference in the growth of the hyacinths due to different cultural media could be detected, but there was a marked difference in the different varieties.

How to make money growing violets, G. SALTFORD (*New York: The Violet Culture Co., 1902, pp. 44, pls. 12*).—This is a short, popular account of violet culture under cold frames and in the greenhouse.

Gilliflower and wallflower culture in Erfurt, R. ENGELHARDT (*Möller's Deut. Gart. Ztg., 17 (1902), No. 34, pp. 405–416, figs. 9*).—A popular descriptive article discussing the methods of pot and field culture of these flowers and methods of commercially growing seed.

Hybridizing Gladiolus species, W. VAN FLEET (*Amer. Florist, 19 (1902), No. 748, pp. 345–347*).—A paper read before the International Plant Breeding Conference, held in New York, September 30 to October 2, 1902, in which the characteristics, markings, etc., of a number of different Gladiolus hybrids are given. The results obtained by the author in crossing many different species and varieties are also noted in the work. Out of 150,000 seedings grown by the author during the past 16 years, only 2 have been thought worthy of naming and commercial introduction.

A classification of sweet peas, H. J. WRIGHT (*Jour. Hort., 54 (1902), No. 2815, pp. 250, 251*).—This classification was made for the use of members of the National Sweet Pea Society of England. It is based on color.

Mendel's laws of alternative inheritance in peas, W. F. R. WELDON (*Biometrika, 1 (1902), No. 2, pp. 228–254, pls. 2*).—A discussion of Mendel's law and the data upon which it is based, with a summary of a considerable amount of other evidence concerning dominance in peas. The characteristics of a number of hybrid peas of the Telephone group are noted and their bearing on Mendel's law of segregation discussed. A bibliography of 32 papers bearing on the various phases of the subjects discussed by the author completes the article.

It appears from the evidence cited that a character which is sometimes dominant is not necessarily always so. "The degree to which a parental character affects offspring depends not only upon its development in the individual parent, but on its degree of development in the ancestors of that parent."

The history of the Telephone group of peas is shown to be clearly inconsistent with the universality of Mendel's law of dominance and segregation. These laws hold only for races of particular ancestry. Neglect to take this fact into account is, in the author's opinion, a fundamental mistake which will vitiate all work based upon Mendel's methods.

Mendel's law applied to orchid hybrids, C. C. HURST (*Jour. Roy. Hort. Soc. [London], 26 (1902), No. 4, pp. 688–695*).—It has been shown that Mendel's formula is of value for the separation of characters in self-fertilized crosses. The author shows that the formula may be extended to the union of specific characters in intermediate primary hybrids. The advantages of orchid hybrids for observations in heredity are pointed out, and a table is given in which is shown the inheritance of pairs of specific characters in 113 distinct hybrids belonging to several genera. Out of 4,548 specific characters united by hybridization, 2,281 resembled either one of the parents, and 2,267 were intermediate between. Of the number resembling the parents, about half resembled one parent and half the other. If A be taken to represent one parent and a the other, and Aa characters intermediate between the two, the formula for the union of the characters becomes A + 2Aa + a, which is the same as Mendel's formula for the separation of characters with peas.

Culture of orchids in leaf mold, L. P. DE LANGHE-VERNAENE (*Gard. Chron., 3. ser., 31 (1902), No. 785, p. 26*).—This method of growing orchids is said to have been originated 12 years ago by the concern of which the writer is a member. The basis of the compost used is oak and beech leaves, with other leaves mixed with them. Before using the compost all leaves not sufficiently composted are sifted out. If the mixture then seems too compact a little coarse sand is added to insure the passage of water. Pots of the usual form are used, the depth of which is about equal to the width near the top. The bottom of the pseudo-bulbs is put on a level with the upper edge of the pot, the soil made firm and covered with a light layer of sphagnum chopped into inch lengths. The amount of water given is regulated according to the genus of orchid. This feature must be learned.

A graft of hybrid Cratægus-Mespilus, J. JENSEN (*Amer. Gard., 23 (1902), No. 406, p. 638*).—An unusual offspring obtained by grafting *Mespilus germanica* on *Cratægus oxyacantha.* The union developed 2 branches of entirely distinct character. One showed a distinct resemblance toward the Cratægus, while the other inherited more of the Mespilus character.

Fundamental principles of plant breeding, L. BURBANK (*Amer. Florist, 19 (1902), No. 748, pp. 341–343; Amer. Gard., 23 (1902), No. 406, pp. 639–642, fig. 1*).—A paper read before the International Plant Breeding Conference, held in New York, September 30 to October 2, 1902, in which the author discusses some of the general principles of plant breeding and indicates the possibilities of this kind of work.

Pictorial greenhouse management, W. P. WRIGHT (*London and New York: Cassell & Co., Ltd., 1902, pp. 144, figs. 86*).—This book gives brief cultural directions and shows pictorially how to pot, prune, and care for the more common flowers of the greenhouse during the different months of the year. An alphabetically arranged table is included, naming the best species or varieties, their color, height, season of blooming, temperature required, culture, etc.

A garden in the suburbs, MRS. LESLIE WILLIAMS (*London and New York: John Lane, 1901, pp. 193, pls. 9*).—This is a popular publication intended for the use of those having limited areas to devote to the growing of shrubs and flowers. Work for each month of the year is briefly noted and suggestions given regarding the buying of plants and similar problems.

European and Japanese gardens (*Philadelphia: Henry T. Coates & Co., 1902, pp. 162, figs. 148*).—This is a collection of papers which were read before the American Institute of Architects at its thirty-fourth annual convention held in Washington, December 14, 1900. The papers discuss in a general way the principal features of gardening in the various countries of Europe and Japan, and are illustrated by many typical examples of gardening in these countries. The paper on Italian gardens was written by A. D. F. Hamlin, that on English gardens by R. C. Sturgis, French gardens by J. G. Howard, and Japanese gardens by K. Honda.

School gardens at School of Horticulture, Hartford, Conn., H. D. Hemenway (*Park and Cemetery, 12 (1902), No. 7, pp. 362–364, figs. 2*).—The author outlines the methods observed in the flower and vegetable gardens of the school with the different grades of pupils, and shows the success that is being attained in this work.

School gardens, their development and functions, D. J. Crosby (*Outlook, 71 (1902), No. 14, pp. 852–861, figs. 7*).—An account of the present status and growth of the school garden movement in Europe and America, with statements as to the purposes of such gardens and their value from an educational standpoint. A bibliography of the literature of the subject is appended.

The preparation of essential oils in the West Indies, J. H. Hart (*West Indian Bul., 3 (1902), No. 2, pp. 171–178*).—This is a brief popular article calling attention to the possibilities of this industry in the West Indies.

Practical treatise on the culture of tropical plants, J. Dybowski (*Traité pratique de cultures tropicales. Paris: Augustin Challamel, 1900, vol. 1, pp. 589, figs. 87*).—In the first chapters of this work the author discusses the general principles to be observed in the growing of tropical plants, considerable space being given to climate, management of soils, use of irrigation water and fertilizers, and the reproduction of plants by grafting, budding, etc. In the latter half of the work specific directions are given for the culture of a large number of tropical garden vegetables and fruits. The matter is treated in 2 chapters, the first dealing with vegetables and the second with fruits. The articles under each heading are arranged alphabetically. The preface to the work was written by E. Tisserand.

A quarter century's evolution in American horticulture, P. O'Mara (*Trans. Massachusetts Hort. Soc. 1901, I, pp. 74–89*).—The author reviews in a popular manner the progress of horticulture, more particularly the growing of plants under glass, during the past 25 years.

Gardencraft, old and new, J. D. Sedding (*London and New York: John Lane, 1902, pp. XXVIII + 215, pls. 9*).—A discussion of the art in gardening, treating of principles rather than details. A memoir of the author by E. F. Russell is included.

FORESTRY.

Report on the forests and forest conditions of the Southern Appalachian mountain region, James Wilson (*Washington: Government Printing Office, 1902, pp. 210, pls. 78*).—This report embodies the salient features of an investigation carried on during the past 2 years on the forests and forest conditions in the Southern Appalachian region. The investigation was undertaken in compliance with an act of Congress making appropriation for the investigation of the forest conditions of the region indicated, with a view to reporting upon the advisability of establishing a forest reserve in that part of the United States. Not only were the forests and general forest conditions examined into, but also the causes which have led up to the present condition, and the possibility of improving them either with or without Government ownership and supervision. The forests were carefully mapped as to their distribution, density, and relative proportion of forest covered and cleared lands, and studies were made on the general character and distribution of all the available species of trees and shrubs in the region, the stand of timber, the extent to which the timber has been cut or damaged by fire, the nature and value of the present holdings, as well as the agricultural conditions of the region indicated. The investigation embraced the southern part of Virginia, southeastern West Virginia, western North Carolina, eastern Tennessee, northwestern South Carolina, and northern Georgia. As a result of the investigation it is recommended that a large forest reserve be established in this region under Federal supervision. As appendices, reports are given by different individuals on the forests and forest conditions in the Southern Appalachians; topography, geology, hydrography, and climate of the Southern Appalachians; and on the present status of the movement for the establishment of the proposed Appalachian forest reserve.

New forest reserves (*Forestry and Irrig., 8 (1902), No. 9, p. 351*).—There have been recently established 7 new forest reserves, of which the Mount Graham, Santa Catalina, and Chiricahua occur in Arizona; the Madison and Little Belt Mountain Reserve in Montana; the Lincoln Forest Reserve in New Mexico; and the Alexandria Archipelago Reserve in southeastern Alaska. A number of changes have been made in other reserves, and at present the total area of National forest reserves is 58,850,925 acres, or about 2.5 per cent of the entire area of the United States.

The Michigan Forest Reserve, T. H. SHERRARD (*Forestry and Irrig., 8 (1902), No. 10, pp. 404–411, figs. 6*).—The Michigan Forest Reserve includes about 60,000 acres of land about the headwaters of the Muskegon River. The geological formation is described and the different types of forest are enumerated. Of these, 44 per cent consist of oak forests, 39 of jack pine barrens, 11 of swamp lands, and 6 of hardwood lands. Based upon a survey of 100 acres, the average number of trees and the volume of timber is estimated. In the jack pine planes the pine predominates, and in the oak forests scarlet oak forms half of the growth on the flats, and the red oak and white oak about 60 per cent of the trees occurring on the ridges. The effect of forest fires on this region is shown, and the present value of the timber is estimated. For the protection of this reserve a form of organization is recommended, which includes a superintendent and such assistants as would be necessary to control the region. It is believed the whole annual cost would not exceed 5 cts. per acre.

The management of Michigan hard-wood forests, W. C. WINCHESTER (*Forestry and Irrig., 8 (1902), No. 10, pp. 411, 412*).—An attempt is made to show why the hard woods of Michigan are not lumbered so as to make possible continuous crops of sawed timber. The principal reasons assigned are the immediate profits that can be realized in cutting the lands clean and the excessive taxation on timber lands, which at present makes it unprofitable to hold them for the second and subsequent crops.

The jack pine plains of Michigan, F. ROTH (*Forestry and Irrig., 8 (1902), No. 10, pp. 413–416, figs. 2*).—A description is given of the jack pine barrens which are well represented in Michigan and regions adjacent to the Great Lakes. These lands are of poor quality and sparsely settled. The cultivated lands are small in extent and of low productive value. They are capable, however, of producing a good growth of jack pine timber, and with systematic treatment could possibly be reforested with still better species. It is believed that the abandoned farms and waste lands will be reforested with jack pine and other species so that the character of the land will be improved and a more certain crop secured.

The protection of the New Hampshire forests (*Forestry and Irrig., 8 (1902), No. 10, pp. 396–398*).—A report is given of a meeting of the State Forest Association of New Hampshire at which steps were taken for the establishment of a forest reserve in the White Mountain region.

Forestry work on the South Mountain Reservation, G. H. WIRT (*Forest Leaves, 8 (1902), No. 9, p. 135*).—At its spring meeting the Forestry Reservation Commission of Pennsylvania decided to establish a forest nursery and white pine plantation on the South Mountain Reservation in Franklin County, Pa. In this region there are said to be many acres of abandoned farm land which are decreasing in value each year and are believed to afford a splendid opportunity for the beginning of forestry work. To do this it was determined to grow the tree stock rather than buy seedlings from nurserymen. A half acre was prepared and sown in white pine seed, a production of from 200,000 to 250,000 seedlings being expected. Besides the seed sown there were planted in the nursery 10,000 1-year-old white pine seedlings and a start was made on a permanent plantation by the setting out of 5,000 white pine seedlings which were set 4 ft. apart each way. This planting is to be followed by improvement cuttings of the young growth occuring on the mountain sides.

Action of the [Pennsylvania] State Forestry Reservation Commission (*Forest Leaves, 8* (*1902*), *No. 9, p. 135*).—At the spring meeting of the commission, purchase of land amounting to 80,500 acres were made. Preparations were begun for the establishment of a nursery for the growth of pine seedlings, and arrangements were made for the planting of 500,000 pine seedlings and 50,000 tulip trees. The nursery selected is considered ideal for the purpose, and water was piped so as to reach all points of the nursery when necessary. There is said to be a spontaneous growth of white pine on the tract which is about 20 years old, which will afford an opportunity for improvement cuttings.

Forestry on the Girard estate in 1901 (*Forest Leaves, 8* (*1902*), *No. 9, pp. 138, 139*).—An account is given of the condition of the forest lands which are a part of the Girard estate and which are under the supervision of the Philadelphia Board of City Trusts. The reforestation of the mountain lands is said to be a serious question. The work of 25 years was almost entirely wiped out by forest fires which occurred in the spring of 1901. More than 4,250 acres of land which contained timber of from 1 to 12 years' growth were burned over, the estimated value of the timber destroyed being $3,044.70.

Study of a chestnut wood lot, A. S. HAINES (*Forest Leaves, 8* (*1902*), *No. 10, pp. 150, 151*).—A report is given of the study of a chestnut wood lot in Chester County, Pa., in which the current increment of trees was obtained by measurements made by the formula adopted by this Department. The trees were divided into 3 groups. The first, which averaged 80 years old, had attained a diameter of 24.5 in., with a current growth of 1.6 per cent. Because the rapid growth had ceased these trees had become very brittle, and the average value was estimated at $2.60 each. The second class averaged 30 years and was 13.5 in. in diameter, with a current growth of 4.4 per cent. These were valued at $1.50 each. The third class of trees, which averaged about 60 years, was 22.9 in. in diameter, with a current growth of 4 per cent, and was valued at $4.10 each. At the present low value of land in the vicinity of this wood lot and with the proposed reduction in the taxes on wood lots, the author believes that areas planted to chestnut under these conditions would pay a larger interest on capital invested than that obtained from the staple agricultural crops.

Forestry in Ireland, W. DICK (*Farmers' Gaz., 61* (*1902*), *Nos. 17, p. 317; 19, pp. 356, 357; 22, p. 403; 23, pp. 420, 421; 27, p. 485; 29, pp. 536, 537; 36, p. 670*).—A series of articles in which the forest condition of Ireland is described and the urgent necessity for reforestation is shown. What are considered the best species for planting are enumerated and historical and other data given to show their relative growing rate, production, and value. The adaptability and importance in order of enumeration are Scotch pine, larch, and ash, followed by the sycamore-leaved maple, 2 kinds of poplar, and oaks.

The natural restoration of the forests of Switzerland, ENGLER (*Rev. Eaux et Forêts, 41* (*1902*), *No. 3, pp. 81–85*).—The author shows the necessity for thinnings, clearing cuttings, allowing seed trees to remain, and the proper production of shade for forest growth. For natural reseeding, the forest must never be wholly deprived of its cover. The best results usually attend the cultivation of mixed species, or at least groups of different species of trees. Natural reproduction is said to favor the production of trees of large size.

The reforestation of loose and worn soils, Matthes (*Rev. Eaux et Forêts, 31 (1902), No. 6, pp. 161–177*).—Suggestions are given for the reforestation of high mountains, loose sands, and worn limestone soils. The methods that have been successfully employed in different countries are described, particular attention being given to the forestation of sandy regions. The preliminary treatment for preventing the shifting of sands is described and the best species of forest trees for different soils and situations are enumerated. The rôle of the Government in such operations is discussed at some length.

Coppice in the Ardennes, C. Delville (*Bul. Soc. Cent. Forest. Belg., 9 (1902), Nos. 4, pp. 197–206; 5, pp. 261–273*).—A description is given of the present condition of the coppice woods of this region and the various means whereby the production and value of these forests have been decreased. Suggestions are also given of various methods for their restoration.

An excursion in the Campine region, E. Nélis (*Bul. Soc. Cent. Forest. Belg., 9 (1902), Nos. 4, pp. 207–213; 5, pp. 274–285; 6, pp. 348–353, pls. 2*).—A description is given of the forests in the Campine region, which consists of an extensive area of sandy land extending through Belgium into Holland. This is partly covered by an artificial forest plantation, and the means adopted for the reforestation are described and results of a number of experiments with fertilizers on forest trees are shown.

On the preservation of the natural characters of forests and uncultivated regions, C. Bommer (*Bul. Soc. Cent. Forest. Belg., 9 (1902), No. 6, pp. 338–348*).—A report is given of a special commission appointed to consider the subject of forestry in Belgium and to suggest methods for its development and improvement.

The characteristics of various species of forest trees as nursery trees (*Bul. Soc. Cent. Forest. Belg., 9 (1902), Nos. 6, pp. 360–365; 7, pp. 439–445*).—Compiled notes are given of the characteristics, value, and adaptability of a number of forest species which are proposed for cultivation and acclimation in Belgium. The species described in the present papers are all conifers.

Report of expert forester on the Hawaiian forests, E. M. Griffith (*Honolulu: 1902, folio*).—A report is given on the present condition of the forests of the Hawaiian Islands, and suggestions made for their retention and improvement. With few exceptions the forests are said to be only valuable in conserving the water supply and increasing the rainfall. The only 2 species of trees which occur in sufficient quantity to be of any commercial importance are kao (*Acacia koa*) and algaroba (*Prosopis juliflora*). As the forests of the Hawaiian Islands contain a very limited amount of merchantable timber, the forestry problem is one of conserving the water supply, which depends upon the preservation of existing forests and restocking some of the denuded slopes, either by natural reproduction or by planting. The denudation of Hawaiian forests has been brought about to a large extent by the pasturing of stock in the forests. Wherever fences have been built the reclamation of forests is said to be as rapid as their destruction when stock are allowed to range freely. In order to place the work upon a thoroughly efficient basis, cooperation will be necesary between the government, planters, ranchers, and others owning or leasing land upon which water is the chief consideration.

The timber resources of the Australian Commonwealth, E. T. Scammell (*Jour. Soc. Arts, 50 (1902), No. 2580, pp. 533–546*).—An address was given in which attention was called to the value of Australian timber, the object being to serve as far as possible the commercial interests of Australia by demonstrating the claims of Australian timber to the favorable consideration of engineers, architects, builders, etc. The forest area of Australia by divisions is given, in which it appears that about 9½ per cent of the total area is forested. The principal woods are briefly described, their uses indicated, and an appendix given in which the common names are alphabetically arranged. The value of a number of species for furnishing railroad ties is shown in tabular form.

The renewal of the forests in Cochin China, C. L. Roy (*Rev. Eaux et Forêts, 41 (1902), No. 1, pp. 17–19*).—A brief account is given of the attempts being made to properly conserve and restore the valuable forests of Cochin China. Attempts have been made to introduce the cultivation of teak, and in 1898 and 1899 14 nurseries were established for the production of teak seedlings. Other nurseries have since been established and the planting of the young trees in permanent plantations was to be begun in August, 1902. Attention is called to some of the more valuable native timber trees, and their preservation and conservative exploitation encouraged.

Report of the forester, and the woods of Tonkin, Brenier (*Bul. Écon., Dir. Agr. et Com. Indo-China, n. ser., 5 (1902), No. 6, pp. 393–419*).—A report of the forester is given in which are included the usual reports of the administration of the forests and the various decrees relative to the exploitation of forests and forest products. A list of the forest trees is appended, in which the species are arranged in 3 groups based upon their relative timber values. The arrangement is according to vernacular names, the scientific names being given wherever known, and the distribution and characteristics of the timber are briefly described.

Forest trees for calcareous soils, P. Mouillefert (*Jour. Agr. Prat., n. ser., 3 (1902), No. 22, pp. 697, 698*).—A description is given of the different kinds of trees adapted to growth in calcareous soils, and the author says that for dry calcareous soils containing a limited amount of clay, sand, iron, and humus, the best species for forest growth is the beech, with birch grown in short rotations. On richer soils which are exploited as coppice, beech, hornbeam, birch, pubescent oak, and species of alder, together with larch and fir in a 25-year rotation, are recommended. For high forests, ash, alder, black locust, spruce, and Scoth pine in 25 to 30 year rotations are recommended.

Profitable tree planting, J. G. Kelly (*Jour. Agr. and Ind., South Australia, 5 (1902), No. 12, pp. 970–972*).—An account is given of the income derived from planting a strip of poor sandy land with sugar gum (*Eucalyptus corynocalyx*) and the broad-leaved wattle. These were planted in alternate rows 6 ft. apart, the land first plowed and harrowed as preliminary to the planting. At the end of the sixth year the wattles were peeled for their bark, but no accurate record was made of the quantity of bark taken off. In 1899 each alternate gum tree was removed, those cut making poles 18 to 20 ft. in length with a mean diameter of 4½ in. The estimated cost of growing the trees and wattles from 1891 to 1902 was about $80, while the bark and poles removed, together with the trees now standing, are estimated as worth $140.

Trees for shelter (*Agr. Jour. and Min. Rec., 5 (1902), No. 14, pp. 458, 459*).—The importance of shelter belts for protecting orchards, gardens, etc., against the cold winter and the hot drying winds of summer is pointed out, and the availability of a number of species of Australian and other trees for use as shelter belts in Australia and South Africa is described.

Street tree planting (*Forest Leaves, 8 (1902), No. 9, pp. 140–142*).—A report is given on trees for street planting and an account of the results of the street tree planting in Washington, D. C., between 1873 and 1887. During that time there were said to have been planted in Washington 78,000 trees, represented by 30 varieties, but seven-eighths of the number were embraced by 10 or 12 species. The characteristics of the different species for street planting are mentioned. The species best suited to the purpose, as shown by the results obtained, are the silver maple, Norway maple, American elm, sycamore, American linden, tulip tree, Carolina poplar, ash-leaved maple, gingko, and pin oak.

Shade trees, W. A. Murrill (*New York Cornell Sta. Bul. 205, pp. 24, pls. 3, figs. 10*).—The object of this bulletin is to aid in increasing the growing interest in shade trees as material aids to the healthfulness and attractiveness of cities and towns, and to consider the principles underlying their selection and care. After a discussion of the value of shade trees, with some account of the various kinds found in different cities, the merits of different trees in common use are considered and lists given of those which have been found by experience to be best fitted for street planting. Suggestions are also made on planting, pruning, protecting, and caring for wounds, and other operations connected with the general care of street trees. The author recommends for general street planting red, pin, scarlet, black, shingle, and willow oak; Oriental and American sycamore; Ailanthus, and Norway maple; and suggests that the gingko, American ash, hackberry, sweet gum, and Kentucky coffee tree merit further trial.

The alders, J. Houba (*Bul. Soc. Cent. Forest. Belg., 9 (1902), No. 6, pp. 353–359*).—Descriptions are given of a number of species of alder, and their value in forest plantations, character of the timber produced, adaptibility, etc., are discussed. The characteristics of the white alder are described at considerable length. The other species are said to be quite similar in their characteristics and uses.

The relationship of some American and Old World birches, M. L. Fernald (*Amer. Jour. Sci., 4. ser., 14 (1902), No. 81, pp. 167–194, pls. 2*).—Attention is called to the possible relationship of some of the species of birches found in the high latitudes of America and Asia.

The slippery elm, J. T. Rothrock (*Forest Leaves, 8 (1902), No. 9, p. 136, pls. 2*).—A description of the slippery or red elm (*Ulmus fulva*). Its characteristics, botanical characters, and physical properties.

Treatment of second-growth white pine, W. I. Hutchinson (*Forestry and Irrig., 8 (1902), No. 9, pp. 370–373, figs. 4*).—Detailed directions are given for the management of second-growth white pine. It is said that the thinnings should be carried on sparingly until the end of the principal height-growing period, which occurs when the trees are about 40 years old. After this the thinnings should be increased, in order to remove the inferior and diseased specimens. If the wood lot does not consist of a pure stand of white pine the thinnings should be mostly of the hard woods. Where natural pruning is not sufficiently active it will be found advisable to assist in removing the lower and dead branches.

The Jersey scrub pine, J. T. Rothrock (*Forest Leaves, 8 (1902), No. 10, p. 152, pls. 3*).—The distribution, characteristics, and physical properties of the Jersey scrub pine (*Pinus inops*) are given.

Notes on the Noble fir (Abies nobilis), J. G. Peters (*Forestry and Irrig., 8 (1902), No. 9, pp. 362–366, figs. 3*).—Based upon investigations conducted during the summer of 1901, an account is given of the utility, distribution, growth, etc., of this fir, which is confined to the Nortwestern portion of the United States, along the slopes of the Cascade Mountains. The rate of growth of seedlings during the first few years is slow, and a marked characteristic of this species is its intolerance of shade. Even the young seedlings require no shade when growing naturally, and are found only in clearings caused by fire or lumbering. The tree is subject to a number of diseases, the most severe of which are *Echinodontium tinctorium*, *Trametes pini*, and *Polyporus schweinitzii*.

The treatment of spruce in artificial plantations, C. Broilliard (*Rev. Eaux et Forêts, 41 (1902), No. 1, pp. 1–9*) —The adaptability of spruce to artificial plantations, the best distances of planting, methods of thinning production, etc., as shown by numerous investigations, are discussed.

Note on the fuel value of cottonwood, C. E. Bessey (*Abs. in Science, n. ser., 16 (1902), No. 395, p. 139*).—There is said to be much prejudice against this tree having any value except for shade and wind-breaks, its fuel value being considered very low. Careful measurements and calculations, made by the writer, show that on account of its rapid growth the cottonwood (*Populus deltoidea*) produces more heat-yielding fuel in a given time than any other commonly planted tree.

Some recent advances in the fireproofing treatment of wood, S. P. Sadtler (*Science, n. ser., 16 (1902), No. 402, pp. 424–428*).—A brief review is given of the various efforts which have been made to render wood fireproof by chemical treatment, and a description is given of the Ferrell process of treating wood. This consists of impregnating the wood with a solution of sulphate of alumina under great pressure. It is said that if a piece of wood be saturated with a solution of sulphate of alumina to a depth of not more than three-eighths of an inch from the surface, and the point of the inner blue cone of a strong Bunsen flame be brought against it and kept in such a position, a boring effect takes place with an abundant separation of alumina. It required, on an average, over three hours for the flame to complete the boring of a piece of white pine 1 in. thick so treated.

Wastefulness in turpentine industry, C. Herty (*Tradesman, 48 (1902), No. 3, p. 76*).—A brief account is given of an investigation conducted under the auspices of the Bureau of Forestry of this Department on turpentine production. According to the estimate of the author, there is a loss of 3 bbls. of turpentine for every 4 bbls. produced, on account of the wasteful methods pursued. The author is convinced that the present method of boxes cut in the pine tree is not only damaging to the tree, but does not secure the best results. Instead of cutting boxes in the tree, the author recommends a system of two flat faces cut on the tree, each containing a slanting incision about an inch deep, from which galvanized-iron gutters carry the turpentine. The importance of the improved method of handling the trees is shown and it is stated that had this method been employed the annual production of naval stores would have been increased nearly 100 per cent.

A first book of forestry, F. Roth (*Boston: Ginn & Co., 1902, pp. 291, figs. 98*).—The increasing interest in forestry in this country has shown the necessity for concise statements of the principles underlying forestry and forest management. In the book here noted the writer has prepared for use in high schools, normal schools, and other secondary schools, clear and concise statements describing the principles of forestry preservation and use, forest planting, reforestation, relation of forests to water supply, as well as giving specific directions for the management of the small woods lot. The various forest industries are described, and accounts given of the enemies of forests, such as fires, insects, diseases, etc., and methods are suggested of preventing injury from these sources. Keys are given by which the common species of trees can be readily distinguished and an alphabetical list of the more important woods and trees of the United States is appended. In this list the principal characteristics of the trees, their distribution and uses are shown. The illustrations are nearly all taken from American material, so that the problems of our own country are prominently presented. Although primarily designed for use in schools, this book is well adapted to the use of the individual reader seeking information along the lines treated.

DISEASES OF PLANTS.

Notes on some West American fungi, D. Griffiths (*Bul. Torrey Bot. Club, 29 (1902), No. 5, pp. 290–301, figs. 10*).—Attention is called to more detailed descriptions of certain species of fungi which have been hitherto described, and the following new species are described: *Tilletia externa* on *Carex filifolia*, *T. earlei* on *Agropyron occidentale*, *Ustilago elegans* on *Chloris elegans*, *Sorosporium bigelovia* on *Bigelovia* sp., *S. williamsii* on *Stipa richardsonii*, *Gymnoconia riddelliæ* on *Riddellia cooperi*, *Puccinia bouvardiæ* on *Bouvardia triphylla*, *P. burnettii* on *Stipa comata*, *P. micrantha* on *Oryzopsis micrantha*, *Æcidium grindeliæ* on *Grindelia squarrosa*, *Æ. dakotensis* on *Aquilegia canadensis*, and *Claviceps caricina* on *Carex nebraskensis*.

Concerning some fungi occurring on tropical economic plants, A. Zimmermann (*Centbl. Bakt. u. Par., 2. Abt., 8 (1902), Nos. 5, pp. 148–152; 6, pp. 181–184; 7, pp. 216–221, figs. 8*).—Economic and descriptive notes are given of a number of fungi that have been observed in Java as affecting cultivated plants. Among those described are *Corticium javanicum* on twigs of cinnamon, cola, etc.; *Peronospora cubensis atra* n. var., on leaves of cucurbits; *Rhizophidium fungicolum* n. sp., on cacao fruits; *Antennaria setosa* n. sp. and *Capnodium javanicum* n. sp., on coffee leaves; *Physalospora fallaciosa* on banana leaves; *Nectria luteopilosa* n. sp. and *N. fruticosa* n. sp., on the fruit of the Liberian coffee; *Ophionectria foliicola* n. sp., *Pleonectria coffeicola* n. sp., *Phyllachora macrospora* n. sp., *Myriangiella orbicularis* n. g. and sp., *Coniothyrium coffeæ* n. sp., upon the leaves of Liberian coffee; *Diplodia coffeicola* n. sp., on the fruit of Liberian coffee; *Glœosporium coffeanum* on the leaves of the same; *Cercospora coffeicola* on the leaves of Arabian coffee; *C. musæ* n. sp., on banana leaves; *Scolecotrichum musæ* on the same, and *Rhombostilbella rosæ* n. g. and n. sp., on Liberian coffee leaves.

Cultures of Uredineæ in 1900 and 1901, J. C. ARTHUR (*Jour. Mycol.*, *8* (*1902*), *No. 62*, *pp. 51–56*).—During 1900 and 1901 the author demonstrated by means of cultures the life cycle of a number of rusts, as follows: *Uromyces euphorbiæ*, *Puccinia caricis*, *P. angustata*, *P. poculiformis*, *P. albiperidia*, *P. caricis-erigerontis*, *P. caricis-asteris*, and *P. bolleyana*.

New species of Uredineæ, J. C. ARTHUR (*Bul. Torrey Bot. Club*, *29* (*1902*), *No. 4*, *pp. 227–231*).—The author describes a number of new species of Uredineæ, all but one of which are indigenous in the United States. The species described are *Uromyces rickerianus* on *Rumex geyeri*, *U. rottbælliæ* on *Rottbællia speciosa*, *Puccinia tosta* on *Sporobolus cuspidatus*, *P. tosta luxurians* on *Sporobolus airoides*, *P. pera* on *Saxifraga mertensiana*, *P. turrita* on *Saxifraga bronchialis*, *P. adenostegiæ* on *Adenostegia pilosa*, *Uredo panici* on *Panicum amarum*, and *U. cephalanthi* on *Cephalanthus occidentalis*.

A new species of Rhytisma, W. A. KELLERMAN (*Jour. Mycol.*, *8* (*1902*), *No. 62*, *pp. 50*, *51*, *pl. 1*).—A description is given of *Rhytisma concavum* parasitic on the leaves of the *Ilex verticillata*.

New Alabama fungi, J. B. ELLIS and B. M. EVERHART (*Jour. Mycol.*, *8* (*1902*), *No. 62*, *pp. 62–73*).—Descriptions are given of about 60 species of fungi, some of which are parasitic on plants of economic importance.

Investigations on the experimental production of plant parasites among some common bacteria, L. LEPOUTRE (*Compt. Rend. Acad. Sci. Paris*, *134* (*1902*), *No. 16*, *pp. 927–929*).—Experiments are reported with *Bacillus fluorescens liquefaciens*, *B. mycoides*, and *B. mesentericus vulgatus*, 3 very common bacteria in soils, air, and water, in which an attempt was made to produce infection upon potatoes, carrots, and parsnips. These roots were grown under conditions which were designed to diminish their resistant properties, after which they were inoculated with cultures of the bacteria. Characteristic rotting and destruction of the tissues took place showing the possibility of the infection of tissues weakened by various causes. The organic acids produced by the bacteria attacked and destroyed the sugar in the various tubers.

Pure cultures of Puccinia dispersa, H. M. WARD (*Proc. Roy. Soc.* [*London*], *69* (*1902*), *No. 458*, *pp. 451–466*, *figs. 2*).—A description is given of a method by which the author has been able to obtain pure cultures of *Puccinia dispersa* grown upon species of Bromus. The method of conducting the experiments is described in detail and the effect of mineral supplies on the infection of the host plant is discussed. The results obtained seem to show that phosphoric acid resulted in the production of a long, limp growth of pale color, and the spots where the fungus was present showed corrosion and collapse of the tissue, instead of the normal appearance. A similar appearance was derived in the case of potash, except the plant was not so drawn or etiolated. When magnesium was added to the cultures the appearance of the plant and fungus spots were more nearly normal. The absence of lime from the cultures seemed to show little effect; but this is believed to have been partly due to the presence of a small quantity in the pots and soil. So far as the results obtained go they suggest that differences in the supply of minerals affect the development of mycelium and of spores, owing to the effect on the host. In cultivating the host the parasite is also cultivated.

The parasitism of Botrytis cinerea, R. E. SMITH (*Bot. Gaz., 33 (1902), No. 6, pp. 421–436, figs. 2*).—According to the author, too much importance has been hitherto ascribed to cellulose-dissolving enzyms upon the parasitism of Botrytis and similar fungi. Two stages in the process of attacking the host plant are clearly distinguished: First, a poisoning and killing of the cells; and second, their disintegration and utilization as food by the fungus. The first effect appears to be produced by a substance which the author believes to be oxalic acid formed by the fungus as a by-product of its metabolism. Following this, a number of different enzyms are secreted which digest the various constituents of the tissues. The identity of these enzyms probably varies in different cases and there are apparently several forms which affect different kinds of cellulose. The enzyms reported as causing the swelling of the cell walls in the lily disease studied by Ward, and the turnip disease reported by Potter, appear to be unlike that produced by *Botrytis cinerea*. The results obtained by the author's investigation are believed to have a suggestive bearing on the parasitism of many other fungi which bring about the rapid destruction of the tissues of the host plant.

"Take-all" in wheat, D. MCALPINE (*Jour. Dept. Agr. Victoria, 1 (1902), No. 1, pp. 74–80*).—A disease of wheat locally known as "take-all" has existed in Australia for 40 years or more, and although investigated at various times the cause of the disease is still in dispute. Just before the stalks appear, the leaves of the wheat lose their color, the outer ones becoming yellow. When the stalk develops it is stunted and never matures. The entire plant soon dies and this may take place over a considerable area. The roots of the affected plants also have a very characteristic appearance. They are stunted and deformed at an early stage and may be thickened and knotted close to the stem. They are excessively covered with the root hairs and new roots are generally thrown out just above the old ones. The disease appears to occur in rather definite areas. It begins with small spots and gradually spreads, the plants dying off in larger or smaller patches according to the virulence of the attack.

Various causes have been assigned from time to time, among them several fungi, nematodes, faulty conditions of soil, drought, etc. The author's observations show that nematodes are a common accompaniment of the disease. Among fungi reported, *Ophiobolus herpotrichus* was found present in many instances, the basal portions of the stem being considerably blackened. A species of Septoria was found exceedingly common but no species of Cladosporium were observed, although this has been claimed to be one of the principal causes of the disease. A circular letter has been widely distributed in which the author seeks information regarding the disease which is still under investigation.

The presence of nematodes and stinking smut in wheat, R. MAIRE (*Bul. Soc. Mycol. France, 18 (1902), p. 130; abs. in Bot. Centbl., 89 (1902), No. 14, p. 396*).—The author reports the coexistence of nematodes, *Tylenchus tritici*, and smut, *Tilletia tritici*, in the grain of wheat.

A new disease of winter barley, L. HECKE (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 5, pp. 746–748*).—A brief description is given of a disease of winter barley which has been recently discovered in Austria The leaves of the affected plants turn yellow and the plant finally dies. Upon diseased specimens, near the ground, between the stem and the leaf sheath, were found numerous round, yellowish-brown bodies which proved to be the sclerotia of an undetermined species of Sclerotinia. It is thought possible that the species may be the same as that described as producing the sclerotium disease of numerous species of grasses.

Tilletia horrida on rice in South Carolina, A. P. ANDERSON (*Bul. Torrey Bot. Club, 29 (1902), No. 1, pp. 35, 36*).—The occurence of smut of rice has been previously noted (E. S. R., 11, p. 463), and was assigned by the author to the fungus *Tilletia corona*. Subsequent observations and comparisons with specimens from Japan have proved the identity of the disease in the two countries, and the organism causing it is now said to be *T. horrida*. The appearance of the disease in South Carolina is traced to an importation of Japanese seed rice made in 1896.

Sclerospora macrospora, a parasite of maize, G. CUGINI and G. B. TRAVERSO (*Staz. Sper. Agr. Ital., 35 (1902), No. 1, pp. 46–49*).—A preliminary note is given on the occurrence of *Sclerospora macrospora* upon maize. The fungus has been previously described as parasitic on plants of the genus Alopecurus in Australia.

Experiments in combating millet smut, L. HECKE (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 1, pp. 22–28*).—The results of experiments, in which millet seed was given a preliminary treatment with solutions of copper sulphate, sulphuric acid, corrosive sublimate and formalin, are reported. A preliminary soaking of the seed for 5½ hours in a 0.5 per cent solution of formalin gave the best results, the plants produced being almost entirely without smut. The fungus in this case is *Ustilago crameri*.

Clover sickness, V. ANZIMIROV (*Selsk. Khoz. i Lyesov., 204 (1902), Mar., pp. 523–542*).—A report is given of experiments and observations of the author, and extensive quotations given from the investigations of Levitski, on the cause of clover sickness. The author quoted states that there is a continual struggle between the clover plant and the bacteria living in its roots. During the first period the bacteria live at the expense of the clover, receiving from it the carbohydrates necessary for their development. In the second stage the clover feeds upon the nitrogenous substances produced by the bacteria from the nitrogen of the air. Under ordinary conditions it is claimed that 2 distinct periods can be noticed in the development of the clover. While furnishing carbohydrates to the bacteria the growth is somewhat retarded, but when it begins drawing upon the nitrogenous substance in the tubercles the development proceeds rapidly. It is believed that too great a number of bacteria in the soil, many of which fail to be transformed into bacteroids, produces the so-called clover sickness. The author concludes that the application of artificial fertilizers and the reduction of the use of stable manure will, to an extent, prevent the occurrence of clover sickness.—P. FIREMAN.

A rust spotting of potatoes, F. BUBAK (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 3, pp. 396–398*).—A description is given of a disease of potatoes in which the tubers presented spots of the color of iron rust. The tissues of the affected areas were brown and hard and had a decidedly bitter taste, while the sound tissue was of normal appearance. A microscopical examination showed marked differences in the tissues of the sound and diseased portions, and it is believed that the trouble was due to a fertilizer of turf acting upon the soil elements, resulting in an iron compound which had an injurious effect upon the development of the tubers.

Tomato blights, N. A. COBB (*Agr. Gaz. New South Wales, 13 (1902), No. 4, pp. 410–414, figs. 2*).—Descriptions are given of 2 blights of tomato, one of which is well known and the other of more recent discovery and less known. The first disease is the tomato leaf blight, due to *Septoria lycopersici*, which is described at some length, and the destruction of diseased material and the protection of vines with Bordeaux mixture are recommended. In addition, drainage of soil, trellising of the vines, and pruning are advised, together with the rotation of crops when convenient. The second disease of the tomato described is designated as rosette. This disease has made its appearance quite recently and seems to be of widespread occurrence. The losses due to it are usually confined to a few isolated plants, although mention is made of the destruction of a large number in one locality. The disease is characterized by the formation of rosettes of small leaves at the ends of the branches of the half-grown vine. Such vines seldom produce fruit of any considerable size, and when fruit is matured it is of a peculiar appearance and of questionable value. So far as the author's observations go, there is little evidence that the disease spreads from plant to plant, and in the present unsatisfactory state of knowledge of this disease no method of cultivation or spraying can be recommended for its prevention. As the affected plants never produce satisfactory fruit, it is suggested they should be pulled up and destroyed as soon as recognized. The outward appearance of the tomato rosette strongly suggests the presence of nematodes or some insects, but so far no such cause has been observed. The fruit when ripened is abnormally colored and possesses an excess of core. The seed are somewhat peculiar in their position, and it is suggested that such seed should not be planted.

Bacteriosis of tomatoes, D. McAlpine (*Jour. Dept. Agr. Victoria, 1* (*1902*), *No. 3, p. 330*).—The author reports having received from various parts of the country tomatoes which were affected by a disease which is believed to be of bacterial origin. The fruit arrives at complete maturity but the blossom end is flattened and discolored, ultimately becoming a pale olive tint. On cutting the tomato lengthwise the healthy part is found quite distinct from the diseased area, the latter being watery and of a dark olive-green color. Bacteria are universally present, and are believed to be the cause of the disease, which is to be investigated further.

The bacteriosis of kohl-rabi, L. Hecke (*Ztschr. Landw. Versuchsw. Oesterr., 5* (*1902*), *No. 1, pp. 1–21, pl. 1*).—A description is given of a bacterial disease of kohl-rabi which has been discovered by the author, and the results of his infection experiments are reported at considerable length. It is shown that this disease is of a truly bacterial nature, the bacteria occurring in the vascular bundles of the leaf, stem, and roots of the plant. It is believed to be due to the same cause as the black rot of cruciferous plants in this country. The bacteria (*Pseudomonas campestris*) gain access through wounds or the water pores of the plant, and in addition to kohl-rabi attack kale, cabbage, and other allied plants. The disease is said to be rather common and widely spread throughout Austria.

Diseases of plants and their remedies, D. McAlpine (*Jour. Dept. Agr. Victoria, 1* (*1902*), *No. 3, pp. 316–325, pls. 2*).—Descriptive notes are given of the peach-leaf curl, shot-hole fungus, and scab. Suggestions are given for the prevention of these diseases by spraying, pruning, etc.

Canker and gummosis of fruit trees, F. T. Brzezinski (*Compt. Rend. Acad. Sci. Paris, 134* (*1902*), *No. 20, pp. 1170–1173*).—A summary is given of investigations begun in 1896 on the cause of the canker of apple and pear trees and of the gummosis of peach, apricot, plum, and cherry. The primary cause of these diseases, the author states, is bacteria. In all cases of the canker examined no instance was ever found in which bacteria were not present in the diseased tissue. In the case of the canker, inoculations were made in 1899 on branches of pear by piercing with a needle and introducing the organisms from pure cultures. After about 15 days the wounds became healed over, but the following year characteristic lesions of canker appeared at a distance of about 1 cm. from the healed wounds. A number of inoculations had progressed so well by the spring of 1902 that there was no doubt of the success of the inoculation. This seems to indicate that the canker is contagious and certain varieties of pear and apple seem predisposed to the disease. A brief description is given of the organism, and that occurring on the pear is said to be almost indistinguishable from that on the apple, although in artificial cultures some differences were noted. Their identity has not yet been proved by cross inoculation. The roots of both pear and apple never present cankerous wounds, but show certain excrescences, the cause of which is yet to be determined.

The gummosis of peach, apricot, plum, and cherry is analogous to that of the canker described above. Inoculations with bacteria in peach produced the characteristic gum flow of the disease, and the cause of gummosis in plums and apricots is believed to be the same as that which causes the disease in peaches. The bacteria causing the gummosis of cherries seems to be distinct from the others, its cultures being whiter and more opalescent.

Cure for canker on apple trees, G. D. Huet (*Agr. Gaz. New South Wales, 13 (1902), No. 6, p. 683*).—According to the author, the canker of apple trees may be cured by pruning and painting over the affected portions of the limbs with hydrochloric acid.

A new form of Fusicladium dendriticum, G. Scalia (*Bol. Accad. Gioenia, Catania, 70 (1901), pp. 1–5; abs. in Bot. Centbl., 89 (1902), No. 14, p. 398*).—A new form of Fusicladium on the Japanese loquat is described. It seems to have affinities with the well known *F. dendriticum*, and the recently described *F. eriobothrya*, and the name *F. dendriticum eriobotryæ japonicæ*, is given it.

Black rot of oranges, N. B. Pierce (*Bot. Gaz., 33 (1902), No. 3, pp. 234, 235*).—A fungus disease of navel oranges has attracted attention in some of the orange-growing districts of California for the past 8 or 10 years. The losses occasioned by the disease frequently amount to as much as 3 to 10 per cent of the crop, and as the cultivation of the navel variety is extensive the total losses are proportionately heavy. The oranges are attacked through the navel, the fungus entering the cracks or imperfections of the peel in those parts. The cells of the pulp are destroyed and soon become black in color and bitter to the taste. The peel is left uninjured until the disease has made considerable progress within, but finally becomes thin and darkened in color over the affected parts. The fungus vegetates freely among the pulp sacks, which are wholly destroyed as far as the mycelium extends. The tissues involved rarely include more than one-fourth of the fruit, and the destruction is commonly confined to the tissues lying near and at one side of the navel. Infected fruit ripens prematurely, showing an exceptionally high color, and soon falls from the tree. The fungus producing this disease is a new species of Alternaria to which the name *A. citri* is given. A specific characterization of the fungus by Ellis and Pierce is given.

Disease of Maryborough oranges, H. Tryon (*Queensland Agr. Jour., 10 (1902), No. 6, pp. 481, 482*).—A report is made on a shipment of oranges which was condemned in a market of New South Wales as being affected by disease. The fruit was found to exhibit various blemishes and injuries of the skin. The first noted was due to the action of hydrocyanic-acid gas, which had been used to fumigate the fruit. The second injury noted was attributed to an Acarus, the injury taking the form of linear markings, spots, blotches, and patches of irregular outline, which are well developed upon the surface of the fruit. These are usually of a dark or blackish-brown color and the coalescence of a number of spots make quite large infected areas, the surface of which is covered with an exudation that is something in the nature of resin. When a portion of this is removed it shows the presence of mycelial threads of fungi, although no particular species seems to be constantly present. The third disease described is one caused by the orange mite (*Phytopus oleivorus*). This disease is present only in a mild form and seldom causes more than a loss of luster to the fruit attacked.

On the development of the anthracnose of bananas, G. Delacroix (*Agr. Prat. Pays Chauds, 2 (1902), No. 7, pp. 89–91, fig. 1*).—The fruit of the banana is said to be frequently attacked by the fungus *Glœosporium musarum*, which causes its ultimate destruction. The fungus is believed to occur as a wound parasite and infection is incurred through wounds occurring upon the green fruit.

A nematode disease of coffee, G. Delacroix (*Agr. Prat. Pays Chauds, 2 (1902), No. 7, pp. 80–88, figs. 2*).—An examination of a number of specimens of Arabian and Liberian coffee from Martinique showed the presence of the nematode *Heterodera radicicola* in great abundance, and it is thought probable that the same disease occurs in Guadeloupe. Accompanying the nematode was found the mycelium of a fungus which is believed to be a species of Rosellinia. Based upon experiments conducted elsewhere, it is thought that injecting carbon bisulphid about coffee trees would not only destroy the nematodes but would also kill the fungus.

Some nematode diseases of plants, G. DELACROIX (*Agr. Prat. Pays Chauds, 1* (*1902*), *No. 6, pp. 672–680*).—Descriptions are given of a nematode disease occurring upon bananas in Egypt, previously reported (E. S. R., 14, p. 264), and a nematode disease of black pepper reported from Cochin China. The latter seems to be due to the common nematode *Heterodera radicicola.* This species of nematode has previously been reported in Java upon the betel pepper, a plant nearly related to the ordinary black pepper.

The epidemic occurrence of Coronartium ribicola in the Dahlen botanic gardens, P. HENNINGS (*Notizbl. Bot. Garten u. Mus., Berlin, 3* (*1902*), *No. 28, pp. 172–175*).—During the summer and late fall of 1901 the different species of Ribes were severely attacked by the fungus *Coronartium ribicola.* It was first noticed upon a bush of *R. nigrum,* toward the end of June, and by the end of July and beginning of August nearly every species of the genus had been attacked, and by the end of August hardly a sound leaf was to be found. Of about 30 species and varieties examined *R. alpinum* was the only one free from the fungus.

Diseases of forced strawberry plants, J. CURÉ (*Rev. Hort.* [*Paris*], *74* (*1902*), *No. 12, pp. 286, 287*).—The frequent occurrence of what the author terms mildew, or rust, is noted. It may be kept in check by spraying with Bordeaux mixture or by the use of 500 gm. potassium sulphid in a hectoliter of water. Healthy plants grown in rich soil and well watered do not seem to be as subject to injury as those grown under less favorable conditions.

Some diseases and parasites of vanilla, A. ZIMMERMANN (*Centbl. Bakt. u. Par., 2. Abt., 8* (*1902*), *No. 15–16, pp. 469–481, pl. 1, figs. 11*).—Notes are given of a number of fungus and insect parasites of the vanilla plant. Among the fungus diseases described are those due to *Nectria vanillæ* n. sp., *N. coffeicola, Physalospora vanillæ* n. sp., *Chætodiplodia vanillæ* n. sp., *Colletotrichum macrosporum, C. incarnatum,* and *Fusicladium vanillæ* n. sp. In addition to the above, attacks of *Aspidiotus aurantii* and the larvæ of an undetermined insect are described.

Two diseases of vanilla, G. DELACROIX (*Agr. Prat. Pays Chauds, 1* (*1902*), *No. 6, pp. 680–688*).—Descriptions are given of *Calospora vanillæ,* the attack of which somewhat resembles an anthracnose, and the rust of vanilla (*Uromyces joffrini* n. sp.).

Grape diseases and their treatment, F. GVOZDENOVIC (*Ztschr. Landw. Versuchsw. Oesterr., 5* (*1902*), *No. 3, pp. 497–500*).—A brief account is given of the occurrence of Peronospora, anthracnose, and oidium of grapes. For the prevention of Peronospora, experiments were conducted with Bordeaux mixture of varying strengths, Bordeaux mixture to which potassium permanganate was added, a solution of nickel sulphate and lime, and zinc sulphate and soda. All of these proved beneficial in preventing attacks of the disease, the Bordeaux mixture and potassium permanganate probably giving the best results.

Suggestions for combating grape mildew, J. M. GUILLON (*Jour. Agr. Prat., n. ser., 4* (*1902*), *No. 32, pp. 177, 178*).—The author discusses the possibility of combating the downy mildew and powdery mildew of the grape by spraying with a single fungicide. For this purpose he suggests the addition of sulphur to any of the ordinary fungicides. The sulphur does not enter into chemical combination, but is held in suspension, and when sprayed upon plants influences but little the adhesive property of the fungicide and at the same time is efficient against the powdery mildew.

Brunissure and the California vine disease, E. H. TWIGHT (*Prog. Agr. et Vit.* (*Éd. L'Est*), *23* (*1902*), *No. 20, pp. 590–592*).—The author calls attention to the claim of Viala and Sauvegeau that brunissure and the California disease of grapes were caused by species of Plasmodiophora (E. S. R., 4, p. 380; 5, p. 423). Recent investigations have thrown some doubt upon the existence of this parasite, and the author believes that the experience in California tends to discredit the theory of the parasitic nature of the disease, which continues locally in the vicinity of Anaheim. A somewhat similar disease is reported as having occurred in Santa Clara County, but this disease was local and is believed to have been due largely to drought, accompanied by late frosts.

Court-noué of grapes in Yonne, G. Chappaz (*Prog. Agr. et Vit. (Éd. L'Est), 23 (1902), No. 32, pp. 173–180, figs. 3*).—This disease, which results in a peculiarly stunted growth of vines, was particularly troublesome in the vineyards of Yonne during 1902. No parasite has been identified with the disease, and it made its appearance immediately following a low temperature and hailstorms occurring early in May. Certain varieties seem to be more subject to injury than others, and the author believes that the injury is due to the hail and the low temperature. This disease, which has been previously described (E. S. R., 12, p. 260), is briefly characterized. During the period reported upon it has proved of very great importance, as most of the grapes which were not directly destroyed by the hail have since succumbed to the disease. No suggestions are given for its prevention.

An epidemic of brown rot in the vicinity of Paris, M. Molliard (*Bul. Soc. Mycol. France, 17 (1901), No. 4, pp. 280–282; abs. in Bot. Centbl., 89 (1902), No. 11, p. 308*).—A severe outbreak of brown rot, due to *Monilia fructigena*, upon apricots, peaches, quinces, and pears is reported, while plums and cherries did not seem to be attacked to any great degree. Inoculations made in April upon young twigs of apricot soon produced the characteristic appearance of the disease. The destruction of all mummy fruits and burning of dead branches are recommended as means for the prevention of the return of the disease.

Development of black rot, A. Prunet (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 18, pp. 1072–1075*).—This article is essentially the same as one noted from another journal (E. S. R., 14, p. 369).

Downy mildew of grapes, Trabut (*Bul. Agr. Algérie et Tunisie, 8 (1902), No. 10, pp. 238, 239*).—The occurrence of the downy mildew on grapes in Algiers is reported and is said to have occasioned considerable loss. The ordinary characteristics of the disease as observed in other countries were not apparent, but microscopic examination showed the presence of the spores of Peronospora. The occurrence of the downy mildew coincided with an attack of brunissure, which led many to think the diseases were identical. Prompt action is recommended for the prevention of the spread of the disease.

The treatment of powdery mildew, J. Dufour (*Prog. Agr. et Vit. (Éd. L'Est), 23 (1902), No. 30, pp. 120, 121*).—A spraying mixture composed of 100 liters of water, 500 gm. of black soap, and 500 gm. potassium sulphid is recommended for spraying upon grapevines for the prevention of the powdery mildew.

Rose rust, D. McAlpine (*Jour. Dept. Agr. Victoria, 1 (1902), No. 1, pp. 81, 82*).—A brief account is given of the rose rust caused by *Phragmidium subcorticium*, and suggestions given for its prevention. Collecting and burning of the fallen leaves and the use of the winter spray of a strong solution of copper sulphate, followed during the summer by sprayings of Bordeaux mixture, will protect the plants against injury.

Septoria disease of carnations, P. Voglino (*Staz. Sper. Agr. Ital., 35 (1902), No. 1, pp. 17–34, pl. 1*).—A description is given of the attack of *Septoria dianthi* upon species of Dianthus. The life history of the fungus is briefly described and the effect upon the host is shown. The fungus is said to live saprophytically upon the dead leaves, and retains its vitality for at least 5 months. A temperature of 25 to 30° C., combined with excessive humidity, is very favorable for the rapid production of the conidia of the fungus, and for the rapid dissemination of the disease. It is recommended that the dried leaves and infected portions of the plant be collected and burned as a precaution against the spread of the disease.

Schizophyllum commune, a parasite of the horse chestnut, F. Gueguen (*Bul. Soc. Mycol. France, 17 (1901), No. 4, pp. 283–298, figs. 5; abs. in Bot. Centbl., 89 (1902), No. 11, pp. 307, 308*).—The presence of this fungus in a number of park trees is noted, and the appearance of the affected portion of the tree is described. Inoculation experiments upon sound horse chestnut trees gave negative results. The fungus is believed to be a wound parasite and is capable of serious injury to the trees. A weakened condition of the trees is favorable to the rapid development of the disease and thorough drainage of the soil is said to reduce the liability of attack.

Some new parasitic fungi of oaks, E. Henry (*Bul. Soc. Bot. France, 48 (1901), No. 5-6, pp. 151–155*).—Descriptions are given of species of fungi which have been recently described as occurring parasitically upon oaks. Among those described are *Pseudovalsa longipes*, *Aglaospora taleola*, and *Pezicula cinnamomea*.

Canker of Abies balsamea in Minnesota, A. P. Anderson (*Bul. Torrey Bot. Club, 29 (1902), No. 1, pp. 23–34, pls. 2*).—While engaged in botanical investigations in northern Minnesota in 1896, the author noticed the balsam firs were affected to a great extent with numerous canker-like growths and swellings. Not infrequently the cankers extended around the tree trunk or branch, causing its destruction. The rough bark of the canker was found to bear numerous ascomata which resembled those of *Dasyscypha calycina* of Europe which produces canker upon the larch. Subsequent studies showed the fungus was probably identical with *D. resinaria*. A description is given of the organism, and although no European specimens have been at hand to compare, the author believes there is no doubt of the identity of the species. The characteristic smooth bark of the fir becomes rough at the canker spot by the formation of ridges and bark projections soon after the infection takes place. The outer bark is broken through and scales off on account of the rapid increased growth of the inner layers of the bark. The effect of the canker on the cortex and wood is described, and although no opportunity has been at hand to perform inoculation experiments, the conclusion is reached that the disease is caused by the fungus mentioned above. The fungus is always found on the bark of the canker spots and nowhere else on the tree. So far as possible to make out, the fruiting occurs on the dead stems and continues only for one season after the stems have been killed by the parasite. The absence of insects and the presence of the mycelium in the bark, as well as in the cambium, and the absence of ascomata from the normal bark of the living tree and its presence on the dead stems, is considered sufficient evidence for establishing the parasitism of the fungus.

The preparation of fungicides, L. Degrully (*Prog. Agr. et Vit. (Éd. L'Est), 23 (1902), No. 19, pp. 548–553, figs. 2*).—Formulas and directions for preparation are given for a number of forms of Bordeaux mixture, Burgundy mixture, a copper sulphate and soap mixture, verdigris, and potassium permanganate.

Purity and control of copper sulphate, E. Chuard (*Chron. Agr. Canton Vaud, 15 (1902), No. 15, pp. 462–465*).—The varying purity of copper sulphate is commented upon, and attention is called to the Federal regulations concerning the analysis and certification of copper sulphate, sulphur, and similar chemicals.

ENTOMOLOGY.

Notes on economic entomology, F. V. Theobald (*Jour. Southeast. Agr. Col., Wye, 1902, No. 2, pp. 20–54, pl. 1, figs. 4*).—*Currant scale insects and their treatment* (pp. 20–27).—The author gives biological, economic, and descriptive notes on *Pulvinaria ribesia*, *Lecanium coryli*, *Mytilaspis pomorum*, and *Aspidiotus ostreæformis*. Of the many remedies which have been recommended in the destruction of these insects the author has found only 3 to be of any real service in killing the scales. Caustic alcohol wash, if applied in the winter, removes scale insects and also lichens and moss. Resin wash also proved successful when applied in the following proportion: Resin, 24 lbs.; caustic soda, 3 lbs.; soft soap, 4½ lbs.; water, 100 gal. Fumigation with hydrocyanic-acid gas is successful if properly applied. Brief notes are also given on the natural enemies of scale insects, including parasitic and predaceous insects and birds.

Social pear sawfly (*Pamphilus flaviventris*) (pp. 27–31).—This insect caused considerable damage in 1889 and again in 1900. It occasionally strips large pear trees of their foliage. The adult appears in May and June. The eggs are laid during bright sunshine, in groups of from 30 to 60 and on the underside of the leaves, usually in rows. The young larvæ form webs, in which 30 or more may be found when half grown. If the larvæ are allowed to develop, the ground beneath infested trees should be treated with gas lime during the winter.

Buff-tip moth (*Pygæra bucephala*) (pp. 31–34).—The caterpillars of this species frequently defoliate elm, beach, birch, oak, and fruit trees. The moth appears in June; the larvæ are gregarious and feed upon the upper surface of the leaf. Where it is impossible to apply arsenical poisons the larvæ may be jarred from the trees and destroyed.

Some notes on ribes-feeding sawflies of Europe and America, and sawfly remedies (pp. 34–45).—Notes are given on the habits, life history, natural enemies, and means of combating *Nematus ribesii*, *N. consobrinus*, *N. appendiculatus*, *N. grossulariæ*, and *N. rufipes*. The number of broods of *N. ribesii* is nearly always more than 2, and according to the author's observations, frequently 4. If the larvæ are allowed to escape to the ground, their numbers may be reduced to some extent by treatment of the soil under infested bushes. This may be done by removal of the soil, or by applying some caustic substance around the bushes. Plowing the soil is usually not effective, since the cocoons must be buried deeply in order to prevent the insects emerging. Quicklime applied to the soil about the bushes has generally given satisfactory results.

Bee moth (*Galleria cereana*) (pp. 45–48).—The insect is described in its different stages and notes are given on its life history. This insect was previously a more serious pest than at present. The cocoons may be detected in the bottom of infested hives, and search should at once be made for any of the pests in the hives. The insect seldom gains a footing in strong, healthy colonies.

Introduction of foreign ladybirds (pp. 48–50).—A number of species of ladybirds have been imported into England from Tasmania. The species which were first sent were *Leis conformis*, *Orcus australasiæ*, and *O. bilunatus*. The first-named species appears to be very hardy and attacks plant lice with far greater voracity than that which is manifested by native species of ladybirds.

General report on insect and other pests in 1901 (pp. 50–54).—In this section the author gives brief notes on a large number of injurious insects to which his attention was called. These species include brown-tail moth, pear midge, codling moth, cutworms, Colorado potato beetle, flea-beetle, etc. Brief notes are also given on worms and insects infesting domesticated animals.

Seventeenth report of the State entomologist on injurious and other insects of the State of New York, E. P. FELT (*Bul. New York State Mus., 10* (*1901*), *No. 53, pp. 699–925, pls. 6, figs. 29*).—As usual in the annual reports of the State entomologist of New York, a brief general account is given of the work of the office, while the main bulk of the bulletin is occupied with a discussion of the insects which were most injurious during the season, shorter notes on less important species, reports of the voluntary observers throughout the State, a bibliography of the publications of the entomologist, and a list of the additions to the insect collection during the year 1901. In the appendix to the bulletin an account is given of the entomological exhibit of the State entomologist at the Pan-American Exposition, together with a catalogue of the insects exhibited.

The Hessian fly caused extensive damages during the season of 1901; detailed notes are given on the amount of injury in different localities and on the time of appearance of the insect. The species is described and notes are given on its habits, life history, parasites, and means of combating it. It was found by comparing weather records with the time of appearance of the Hessian fly that there is some apparent connection between these two phenomena. An extensive bibliography of the literature on the Hessian fly is added to the article on this insect. During the season of 1901 a large number of other species of insects were more or less injurious, and notes are given on several of these species, among which the following may be mentioned: Fruit-tree bark-beetle, grapevine fidia, *Colaspis brunnea*, round-headed apple-tree borer, forest tent caterpillar, grapevine leaf-hopper, *Cenopis diluticostana*, elm-leaf beetle, *Rhabdophaga salicis*, carpenter moth, leopard moth, birch-leaf bucculatrix, blister beetles, flea-beetles, squash bug, rabbit botfly, garden flea, European praying mantis, croton bug, and orange dog.

Insecticide experiments were carried out by the author in developing effective remedies for controlling the San José scale. The apparatus used was a hand kero-water spraying machine, and the insecticides with which the experiments were made included mechanical emulsion of kerosene oil, crude petroleum, a mixture of whale-oil soap and crude petroleum, and whale-oil soap in water. As the result of these experiments it was found that a 20 per cent or 25 per cent mechanical emulsion of crude petroleum was most effective. The combination of crude petroleum and whale-oil soap gave good results but were not as effective as the mechanical mixtures of crude petroleum. None of these preparations caused any injury to the trees. The experiments with whale-oil soap indicate that this insecticide is valuable for checking the injuries of the San José scale but can not be relied upon to do as thorough work as crude petroleum. A few tests with undiluted crude petroleum confirm the author's previous experience that it is an unsafe insecticide.

Report of the government entomologist for the year 1901, C. P. Lounsbury (*Cape of Good Hope Dept. Agr., Rpt. Govt. Ent. 1901, pp. 103, pls. 6*).—The chief lines of work undertaken by the entomologist during the year 1901 were investigations of the heart-water disease of goats and sheep, malignant jaundice of dogs, fumigation of buildings with hydrocyanic-acid gas, and experiments with insecticides. The experiments previously reported by the author on the subject of malignant jaundice in dogs indicated that this disease was transmitted by the tick known as *Hæmaphysalis leachi*. Further experiments along this line served to confirm the results already obtained. They show also, as previously suspected, that the tick is innocuous in its larval and nymphal stages and pathogenic only in the adult condition.

Many experiments have been tried in importing various natural enemies of injurious insects. *Cryptolæmus montrouzieri* was introduced from Australia and California, for the purpose of holding mealy bugs in check. The beetles were distributed in several places, but apparently did not survive. Similar experiments in introducing beneficial insects were made with *Chilocorus bivulnerus*, *Hippodamia convergens*, *Megilla maculata*, and *Exochomus pilatei*, as well as with fungus diseases. Some of these experiments were unsuccessful, the insects failing to survive, while in other cases good results appear to have been obtained.

An extensive series of experiments was made to determine the relationship of the bont tick (*Amblyomma hebræum*) to heart-water disease of sheep and goats. The account of the author's experiments in cooperation with the veterinary service of Cape Colony is preceded by a general description of the disease and discussion of its symptoms, etiology, and distribution. Special devices were adopted for preventing ticks with which experiments were being made from leaving the experimental goats and sheep upon which they were placed. The numerous experiments which are reported in this paper indicate uniformly that *A. hebræum* is alone concerned in the transmission of this disease, while *Rhipicephalus evertsi*, *R. decoloratus*, and *Onithodoros savignyi* are not concerned in the transmission of heart water. It was shown during the experiments that one single specimen of bont tick was capable of producing fatal infection in a healthy susceptible animal. Adult ticks fed as nymphs on sick animals are capable of transmitting infection, and the same was found to be true of adult ticks which had fed as nymphs on cows, but as larvæ on diseased animals. It appears, therefore, that cattle may serve to carry the disease, while not being infected. The disease was experimentally transmitted by adult ticks which had fed in a nymphal stage on long recovered goats, but on sick animals in the larval stage. Experiments indicated that animals which have recovered from heart water are still subject to infection, but that their power of resistance increases after they have been kept exposed to reinfection for some time. It was shown experimentally by the author that the bont tick is normally innocuous so far as heart water is concerned, and that the progeny of pathogenic bont ticks is noninfectious. Each tick, in order to become dangerous, must at some stage of its existence suck the blood of diseased animals. It was found also during these experiments that bont ticks dropped during the period of incubation were harmless. As the result of the author's experiments it is recommended that diseased animals be promptly isolated, and that careful attention should be given to the behavior of the flock in order to attack the first case of heart water which may appear. It is believed that this infection can be eliminated from any given area by excluding all susceptible animals for a period of greater or less length.

The authors' experiments in the fumigation of buildings with hydrocyanic-acid gas indicate that flies are more susceptible to the gas than fleas and bedbugs, while *Argas persicus* is quite unaffected by it. The eggs of the bedbug, flea, and small cockroaches are destroyed by the gas. The remedy, however, was found not to be effective in destroying weevils and other insects which are deeply embedded in masses of food stuff or other material.

Experiments with insecticides were conducted by C. W. Mally in the treatment of *Diaspis pentagona*, *Aspidiotus aurantii*, and woolly aphis. The conclusions reached from these experiments are that lime, sulphur, and salt wash is the best remedy for white peach scale; that resin wash of standard strength is a cheap and effective remedy for woolly aphis (above the surface of the ground); that several applications of this insecticide will hold the red scale in check, while on the other hand the remedy is useless for white peach scale. Soap washes proved unsatisfactory for use against the white scale, and mechanical mixtures of kerosene with water seemed to be of little value.

Second report of the government entomologist, 1901, C. Fuller (*Natal Dept. Agr., Rpt. Govt. Ent. 1901, pp. 72, pls. 3, figs. 23*).—The greater portion of the report is occupied with biological and economic notes on the large variety of insects and fungus diseases which caused losses to crops during the season 1901. The species of insects thus discussed include *Sesamia fusca* injurious to young corn; a species of Animula which attacks acacia; a number of species of fruit-piercing moths injurious to guavas and peaches; *Heteronychus arator* which attacks corn under ground and causes considerable damage; *Ceratitis corysa* injurious to grapes and other fruits; *Hippobosca struthionis* parasitic on ostriches, pigeons, and other birds; sheep tick; *Acridium pupuriferum;* black peach aphis; and clover mite. The treatment for *Heteronychus arator* recommended by the author includes the use of lantern traps for attacking the beetle, hand picking, and applications of salt. In combating the plague locust the use of arsenic baits is recommended, as well as spraying with soap solution and other well-known remedies. A general discussion is presented on the efficacy of the South African locust fungus. The author believes that attention was first called to this parasite by J. M. Wood in 1895. In the experience of the author the fungus is of some value, but is not sufficiently effective to justify its use except where other remedies have proved useless or inapplicable. Notes are also given on a sugar-cane disease supposed to be due to *Strumella sacchari*, peach-leaf curl, dodder on alfalfa, varieties of oats which are resistant to rust, and *Phytophthora infestans*.

Descriptive notes are given in an appendix on a spraying machine devised by

A. M. Pearson for spraying a number of rows of vines or hops simultaneously. The sprayer is arranged to be propelled by horse power.

The results of some experiments with insecticides on some garden and greenhouse pests, R. NEWSTEAD (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1902*), *No. 4, pp.* [illegible], *figs. 5*).—Experiments with kerosene emulsion in treating *Lecanium persicæ* have been continued with the result that this insecticide is highly recommended for killing the scale. It is urged, however, that care must be used in its preparation in order to make it most effective.

Special studies were made of 2 species of subterranean mealy bugs, *Ripersia terrestris* and *Dactylopius radicum*. *R. terrestris* was found infesting the roots of Stephanotis, and later was found on the roots of palms and maidenhair fern. *D. radicum* was found to be injurious to strawberries, but its natural food plants appear to be grasses and *Armeria maritima*. In treating infested plants or greenhouses for these pests it is recommended that infested plants should not be turned out of the pots while in the conservatory; they should be removed and all soil shaken from the roots, after which the roots should be washed clean. The exposed roots and soil may then be sprayed with carbon bisulphid. The pots are to be scalded and plants may be replaced immediately after spraying.

It is reported that *Selandria atra* was especially injurious during 1899 to wall-trained pears and cherries. Notes are given on the habits and life history of this species. It is recommended that the soil be removed from around the base of the tree to the depth of 4 in. and that this soil be deeply buried or subjected to a high degree of heat. Boiling water, according to the author, is not sufficient to kill the pupæ. It is recommended that trees be sprayed with Paris green at the rate of 1 oz. to 20 gal. of water. The first application should be made when the leaves are very small, and the second about the middle of July, at which time the percentage of Paris green may be doubled. Experiments with lime dressings, hot water, and kerosene emulsion gave negative results. Notes are also given on fruit-tree tortrix (*Penthina variegana*). The habits and life history of the species are described. In combating this insect it is recommended that an application of Paris green be made when the buds are opening, at the rate of 3 oz. to 20 gal. of water, and a second application after the larvæ have spun the leaves together, at the rate of 2 oz. to 20 gal. of water.

Insect enemies of the pear, plum, peach, and cherry, C. P. GILLETTE (*Colorado State Bd. Hort. Rpt. 1901, pp. 55–77, figs. 21*).—Notes are given on the habits, life history, and means of combating the more important insect pests of these fruits. Among the insect enemies of the pear the following are discussed: Flat-headed apple-tree borer, apple-tree slug, Putnam's scale, apple aphis, woolly aphis, and pear-leaf blister mite. Notes are given on the following insect enemies of the peach: Peach aphis, peach-tree borer, peach-twig borer, and peach lecanium. Among the enemies of plums the following are discussed: Fruit-tree bark-beetle, plum gouger, and plant lice.

Remedies for insect and fungoid pests of the orchard and farm, A. M. LEA (*Pub. Dept. Agr. Tasmania, 1902, pp. 38*).—The codling moth is considered the most serious insect pest of Tasmania. Where the orchard is small and isolated it is suggested that perhaps the best way of combating the insect is to destroy the entire fruit crop for one season. In Tasmania this insect is single brooded. The author's experience indicates that 3 sprayings with arsenites, once before the lobes have closed, furnish quite effective means for combating this insect. It is considered necessary, however, to pick off the infested apples and bandage the trees. The Tasmanian custom of placing a bundle of sacking in the fork of the tree is considered less effective than the band.

Descriptive and economic notes are also given on potato moth, cabbage worm, cherry slug, scale insects, woolly aphis and other plant lice, a number of plant bugs, grasshoppers, earwigs, red spiders, pear-leaf blister mite, clover mite, and black spot and bitter rot of apples as well as peach-leaf curl, fire blight, and potato scab. Formulas are given and also directions for preparing Paris green, arsenic and soda, hellebore, lime-sulphur-and-salt wash, whale-oil soap, kerosene emulsion, resin wash, Bordeaux mixture, ammoniacal copper carbonate, and other insecticides and fungicides. The 2 beetles which are most injurious to strawberries are considered *Otiorhynchus sulcatus*, *Rhinaria perdix*. The only boring insect especially injurious to fruit trees in Tasmania is said to be *Maroga gigantella*.

Injurious and useful insects, L. C. Miall (*London: George Bell & Sons, 1902, pp. VIII + 256, figs. 103*).—As stated by the author, this volume is intended to help beginners in identifying the common species of injurious insects and to stimulate interest in the relation of insects to economic agriculture, horticulture, and forestry. The general anatomy of insects is described in considerable detail, and special chapters are devoted to the common injurious species of beetles, moths, butterflies, Hymenoptera, Diptera, plant lice, scale insects, and other miscellaneous injurious insects. Notes are given by way of description and identification of common species in the various orders. In part 4 of the volume the author discusses methods of preventing or checking the injury caused by insects.

The enemies of agriculture, A. L. Herrera (*Las plagas de la agricultura. Mexico: Ministerio de Fomento, 1902, pp. 178, pls. 2*).—This is a general treatise on the subject of injurious insects and methods of combating them. It includes the classification of insects, the preparation and use of fungicides and insecticides, and special notes on different methods of treatment, including mechanical methods and the use of natural enemies of insects. In addition to detailed formulas and directions for the preparation of insecticides and fungicides, notes are given on combinations of fungicides and insecticides and on methods to be adopted in combating the attacks of the more important injurious insects. The various agricultural and horticultural crops are arranged in alphabetical order and mention is made under each plant of the more important insect enemies which attack it.

Caterpillars and their moths, Ida M. Eliot and Caroline G. Soule (*New York: The Century Co., 1902, pp. 302, pls. 80, figs. 2*).—In this volume the authors have dissussed the developmental stages and life history of a considerable variety of moths selected on account of their suitability for class work and beginners in entomology. The subjects discussed in the volume include the arrangement of an insectary, a description of the various stages and general habits of insects, methods of rearing insects, methods of collecting insects in various stages, parasitic insects, and special descriptive notes on the appearance, habits, and life history of representative species of a number of families of moths.

Enemies of wheat, G. F. de Champville (*Les ennemis de blé. Paris: F. de Launay, 1902, 3. ed., pp. 152, figs. 6*).—In this pamphlet the author attempts to present a practical treatise on entomology, taking as his illustrative examples the insects which are injurious to wheat. The species which are considered by the author include the Angoumois grain moth, *Calandra granaria*, *Bruchus granarius*, *Tinea granella*, *Tenebrio mauritanicus*, larvæ of cock chafers, *Cephus pygmæus*, Hessian fly, *Chlorops lineata*, *Zabrus gibbus*, *Agrotis segetum*, *Ochsenheimeria taurella*, *Agriotes lineatus*, grain aphis, and locusts. In addition to a discussion of insects injurious to wheat the author presents a brief account of other enemies, including *Tylenchus tritici* and rust. Attention is also called to the desirability of protecting bats, toads, and insectivorous birds, on account of their beneficial action in destroying injurious insects.

The diamond-back moth, G. H. Carpenter (*Jour. Dept. Agr. and Tech. Instr. Ireland, 2 (1901), No. 2, pp. 275–279, figs. 7*).—This insect is reported as having caused unusual damage to cultivated cruciferous plants during the season of 1901. Notes are given on the habits and life history of the species. A number of birds have been found to feed upon the insect, and it may also be destroyed, under favorable circumstances, by spraying with kerosene emulsion. At times it is difficult to control their ravages, but when they are especially numerous it is suggested that some help may be derived by frequent shaking and brushing of the plants accompanied with thorough cultivation between the rows.

Report on codling moth investigations in the Northwest during 1901, C. B. Simpson (*U. S. Dept. Agr., Division of Entomology Bul. 35, n. ser., pp. 29, pls. 5, fig. 1*).—During the season of 1901 there was an unusually small crop of apples in Idaho and the injuries from the codling moth were excessively great. The remains of as many as 23 eggs were found on a single apple. Pears were only slightly infested and no cases were found where the codling moth had attacked quinces, rose hips, peaches, prunes, or plums. Of the different varieties of apples Pewaukee was always badly infested and Winesap was least infested. The greatest amount of infestation was observed in the Upper Sonoran life zone. On an average about 83 per cent of the first generation of larvæ entered the apple at the calyx end. The majority of the larvæ of the second generation entered at some other point than the calyx. The average length of time for the larvæ to become full grown was about 22 days, and the time required for spinning the cocoon, 5 days. In the summer about 21 days elapsed between the spinning of the cocoon and the emergence of the moth. A greater number of female moths were observed than males. Nearly all of the eggs of the first generation were laid upon the fruit, while those of a later generation were deposited upon the fruit and leaves.

Special attention was given to the question of the number of generations. From extensive records kept of the number of larvæ under bands it is concluded that there are only 2 generations, or that if there is a third it is of little or no importance. In the Northwestern States comparatively few eggs hatched. The causes of this appear to be infertility, dryness, and the effect of the sun's rays. Experiments thus far conducted indicate that it is impracticable to combat this insect in the egg stage. The 3 remedies most enthusiastically recommended are spraying, banding the trees, and picking and destroying wormy fruit. It is recommended that trees be sprayed immediately after the blossoms fall, and that a second spraying be given about a week or 10 days later. The writer believes that the first spraying is the most important of all and is perfectly effective if thoroughly done. Late sprayings are not recommended. As material for spray Paris green in the proportion of 1 lb. to 160 gal. of water, with 2 lbs. of lime is recommended. Arsenate of lead is equally effective. The use of trap lanterns and baits for the moths are considered ineffective.

The codling moth, J. H. Crowley (*Colorado State Bd. Hort. Rpt. 1901, pp. 30–39, figs. 2*).—In this article the author relates his experience in combating the codling moth. Notes are given on the life history of the insect in Colorado. The author recommends that trees be sprayed as soon as the flowers have been pollenized by bees and that the application of Paris green be repeated at intervals according to the season. The author also used bands and examined them at intervals of 8 days until September 1.

Successful treatment for codling moth, W. S. Coburn (*Colorado State Bd. Hort. Rpt. 1901, pp. 78–82*).—The trunks and larger branches of the trees were carefully scraped and the soil underneath the trees was thoroughly cultivated in order to destroy the pupæ which might be concealed near the surface. After the petals fell the insecticide treatment applied consisted in the use of the following formula: $\frac{1}{4}$ lb. white arsenic, 4 lbs. sal soda dissolved in hot water and boiled for 15 minutes; this was diluted so as to make 40 gal., and 4 lbs. of lime was slaked and added to the mixture. It was found that best results were obtained when several applications were made so as to destroy part of the second brood of the codling moth. Infested apples were hooked off the tree as soon as detected and eaten by hogs and sheep which were allowed to run in the orchard.

The California peach-tree borer, C. W. Woodworth (*California Sta. Bul. 143, pp. 15, figs. 7*).—This insect is said to be the most injurious insect in the Santa Clara

Valley and is abundant on peach and apricot trees and on prune trees which are grown on peach and plum roots. The insect does not appear to be injurious in any other part of California. The moth has been collected, however, in nearly all parts of the State. Brief notes are given on the members of the family Sesiidæ in California, including the species discussed in the bulletin of which the proper name is *Sanninoidea opalescens*. The life history of this species is not well known. The insect is active throughout the winter season and pupation does not occur until late spring. The most obvious sign of the presence of the larvæ in a tree is the exudation of gum. This, however, is not a certain evidence of the presence of the larvæ, since gum may appear on trees which do not contain the peach-tree borer, and may be absent in trees which are infested with this insect. The burrow of the larvæ is usually in a vertical direction. The moth lays a large number of eggs upon the trunks of the trees. During the summer moths are produced continually and eggs and larvæ of various sizes may always be found. It appears, however, that there is only 1 brood of the insect per year.

The remedies which have been applied in Eastern States to the eastern peach-tree borer have not proved economic or effective in California. By far the best results in fighting the peach-tree borer were obtained from the use of carbon bisulphid. It appears that this is the cheapest remedy, and when properly handled there is little or no danger to trees. It is stated that some growers pour the liquid directly on the bark of the trees without bad effects. The character of the soil is the most important factor in determining whether or not the trees suffer injury from the insecticide. If the soil is loose and reasonably dry the fluid volatilizes rapidly and does not injure the tree. It is recommended that the carbon bisulphid be poured on the ground near the trunk of the tree and that the earth be thrown up around the trunk in the form of a mound. As a rule about 1 oz. is sufficient for each tree. In common practice, however, the amount is made dependent upon the size of the tree. A small can has been devised in which the proper amount may be readily measured and poured upon the ground around the tree. Treatment with bisulphid of carbon has been confined almost wholly to the winter season; since much injury is done by the borers during the summer it appears advisable to make 1 or more applications during the summer. If but 1 application is to be made it is recommended that this be done early in the winter.

Two peach scales, H. A. Gossard (*Florida Sta. Bul. 61, pp. 469–498, pls. 4*).—An application of undiluted crude petroleum was given to pear, plum, and peach trees on January 25. Two of the pear trees died later of blight, but the scales were apparently killed by the crude oil. A number of plum trees of 8 different varieties which were treated with the undiluted crude petroleum died, and the number of trees which died during the year following the spraying was larger than that of check rows. The same application was made to 9 bearing peach trees of the Florida Gem variety. Of this number only 2 or 3 ever showed any signs of life during the succeeding season, and all died. Several young plum and peach trees of different varieties were sprayed with from 15 to 30 per cent mechanical mixture of petroleum and water in February without suffering any injury. Applications of kerosene in mechanical mixture of water at the same time gave less satisfactory results than the crude oil. No injury was done to the trees by these diluted applications.

The parasitic fungus *Sphærostilbe coccophila* is said to have developed so vigorously in some localities as to render insecticide operations against the San José scale unnecessary. Notes are given from correspondence with practical orchardists who report good results from the distribution of this fungus. One orchardist states that after 2 years' experience with crude oil he considers the San José scale as a very easy pest to control. This orchardist used 25 per cent mechanical mixture of crude petroleum. When the proper winter treatment has been given, summer treatment is seldom required. Crude petroleum, however, can not be used in summer nor upon evergreen plants. A 10 to 15 per cent mixture of kerosene and water may be applied on sunny days, or whale-oil soap at the rate of 1 lb. to 4 gal. water. An examination of a 40-acre peach orchard about 12 years of age indicated that although San José scale had been present for 6 or 7 years, *Sphærostilbe coccophila* had held the scale in check without the assistance of any insecticide treatment. It is believed that at least during the warm rainy weather the fungus is capable of controlling the scale. Spraying with kerosene, crude oil, whale-oil soap, or resin wash destroys the fungus, while fumigation with hydrocyanic-acid gas does not affect it.

White peach scale (*Diaspis pantagona*) was first observed in Florida in 1889. The infestation appears to have come from California. A list of the food plants of this species is given, together with notes on its appearance and life history. This scale may be controlled by the winter treatment recommended for San José scale or by fumigation under tents. The chief natural enemies are *Chilocorus bivulnerus*, and the parasitic fungus mentioned as an enemy to San José scale.

Treatment for San José scale in orchards. II, Spraying with kerosene and crude petroleum, F. A. SIRRINE (*New York State Sta. Bul. 213, pp. 25–51, pls. 4*).—The experiments in controlling the San José scale reported in this bulletin were made on Long Island and in Westchester County, N. Y. The applications of oil were made by means of pumps for producing a mechanical mixture with water. It was found that the mixture produced by such pumps always varied to the extent of 5 per cent on either side of the percentage which was desired. During the experiments in the use of kerosene it was found to be unsafe to use low-grade kerosene in a 15 per cent mixture in water on peach trees in a dormant condition. The same mixture appeared to injure apple trees, even in a dormant condition. It is believed, therefore, that low-grade kerosenes are unsafe at all seasons of the year and for all kinds of trees. Moreover, it proved to be unsafe to use 150° flash-test kerosene in a 15 per cent mixture of water on dormant peach, or to spray apple trees with pure kerosene or a 50 per cent mixture as late as March 13. It was found during these experiments that mechanical mixtures of kerosene varying from 15 to 25 per cent may be used on apple and pear while the trees are in full leaf, but that similar mixtures varying from 10 to 15 per cent are liable to cause damage to stone fruits in the same condition. In the author's experiments it was found safe to apply a good grade of kerosene to pear and apple trees in a dormant condition, but that these trees were injured if sprayed after the beginning of growth in the spring. With stone fruits the reverse condition held true. The use of dilute mechanical mixtures of kerosene on dormant peach invariably killed the tree, while pure kerosene was applied when the buds were swelling with but little injury. The tests with crude petroleum were made on plum, peach, pear, and apple. It was found that pure crude petroleum, or even a 50 per cent mechanical mixture, could not be safely used on apple, peach, or pear. Crude petroleum of a specific gravity of 0.795 in a mechanical mixture of 15 per cent injured pear buds to some extent, while a mixture of 50 to 60 per cent killed all the buds. The trees apparently recovered from the treatment, however, and put forth other buds from which a good crop of fruit was developed. A 15 per cent mechanical mixture of crude petroleum killed all the fruit buds on peaches and a 25 per cent mixture killed the trees outright. A 15 to 25 per cent mechanical mixture of crude petroleum had no bad effect on peaches and plums when applied after the buds had begun to swell. During these experiments it was shown that 1 application of a 15 per cent mechanical mixture of crude petroleum did not kill all the scales, but that 2 applications of this strength, or 1 of 25 per cent mixture, killed all the scales which were touched with the spray. The cost of spraying pear trees 12 ft. in height with crude petroleum was 12 cts. per tree, while the cost of spraying standard apple trees with crude petroleum was 40 cts. per tree. While spraying under favorable conditions costs only about one-third as much as fumigation, it is urged that spraying is a disagreeable method of controlling San José scale, and that the narrow margin between the quantity of oil required to kill the scale and the amount which will injure the tree renders the result uncertain.

Treating San José scale in Southeastern New York, F. H. HALL and F. A. SIRRINE (*New York State Sta. Buls. 209 and 213, popular ed., pp. 8, figs. 2*).—A popular summary of Bulletins 209 (E. S. R., 13, p. 1064) and 213 (noted above) of this station.

Experiments for the destruction of San José scale, W. J. ALLEN (*Agr. Gaz. New South Wales, 13 (1902), No. 6, pp. 644–646*).—The results of a number of experiments by the author and various fruit men in the destruction of the San José scale are reported. Good results were obtained from the use of lime, salt, and sulphur spray containing 30 lbs. of lime, 20 lbs. of sulphur, 15 lbs. of salt, and 60 gal. of water. The use of kerosene also gave excellent results and the scales in most instances seemed to be entirely exterminated. Some injury to the trees, however, is reported from the use of pure kerosene.

A new method of destroying Tortrix pilleriana and other injurious insects, P. VERMOREL and GASTINE (*Jour. Agr. Prat., n. ser., 4 (1902), No. 30, pp. 106–108*).—Experiments were carried on for a number of years in the destruction of *Tortrix pilleriana* and *T. ambiguella* by the use of ordinary insecticides in a fluid and gaseous form. None of the numerous insecticides used in either of these forms proved effective in the destruction of these insects. Resort was finally had to the use of heat. It was found that most insects, including the 2 species mentioned, were destroyed by exposure to a temperature of 48 to 50° C. for a period of 3 or 4 minutes. They were also destroyed by exposure to a temperature of 45° C. for 10 minutes. This temperature was found to be without injurious effect upon grapes. The apparatus used in these experiments consisted of a bell-shaped metallic vessel which was supported over the plant and the necessary degree of heat was obtained from hot water maintained in a vessel under the bell-shaped apparatus. As soon as a temperature of 40 to 45° C. was reached in the bell-shaped device the insects began to come out from their hiding places and fall into the water, where they were immediately destroyed. It is believed that this method is worthy of further trial and promises good results in destroying the species mentioned as well as other insects.

An account of the black currant bud gall mite, E. J. LEWIS (*Jour. Southeast. Agr. Col., Wye, 1902, No. 2, pp. 55–80, pl. 1, figs. 2*).—A general account is given of the habits of the family of mites to which this species belongs. The author discusses the spread of the disease and describes the mite in the various stages, and the symptoms by which infestation by the mite may be recognized. Notes are given on the life history of the mite and its possible enemies. The variety of currant which has been chiefly attacked had until lately been the Baldwin. Lately several others have been almost equally infested. A brief account is given of the means of distribution of this mite, and of the remedies which have been recommended for combating it. These remedies have almost without exception proved useless. The author undertook extended experiments for the purpose of determining the possible value of fumigation with hydrocyanic-acid gas in combating this mite. In none of the author's experiments was the disease entirely checked. Even where the best results were obtained there were still a few infested buds to be found on inspection after fumigation. In many cases a large percentage of the mites remained unaffected by treatment with the gas. The gas apparently had no effect upon the eggs. It is suggested that 2 or 3 fumigations at intervals of not too great length might be more effective than a single application of gas.

Grasshoppers in California, C. W. WOODWORTH (*California Sta. Bul. 142, pp. 36, figs. 17*).—Grasshopper outbreaks of more than usual severity occurred in Roseville, Fairoaks, and Orangevale. When an attempt was made to induce the local authorities to adopt the proper methods for destroying the grasshoppers upon their breeding grounds it was found that such measures could not be safely adopted on account of the possibility of local authorities becoming responsible for damages.

Notes are given on the habits and life history of grasshoppers and brief descriptions are presented of the various species which occur in California. The author presents a list of the more important outbreaks of locusts which have occurred in California up to the present time. It is stated that danger from locusts in California arises chiefly from a comparative narrow strip of rolling land used for pasture. This land lies on the east of the Sacramento and San Joaquin valleys. Notes are given on the conditions which determine migration of locusts.

For controlling flying swarms of locusts the author recommends driving away by means of smudges, by armies of men, and poisoning by means of baits. For controlling drifting swarms, barriers, smudges, plowing under, poisoning by baits, and the use of a hopperdozer are recommended. Practical tests of the method of sacking trees to prevent injury from locusts indicate that this method is dangerous. Most of the trees are injured and lose their lives or show an unthrifty condition. For controlling locusts in their breeding grounds it is recommended that the ground be plowed in the fall, or that the area be burned over before the locusts are able to fly. Hopperdozers may be used quite effectively upon the breeding grounds. In order to prevent the depredations of locusts upon fruit trees it is considered necessary to make a careful survey to determine the breeding grounds of the locusts, especially such areas as are contiguous to large fruit-raising districts, and to secure legislation which will empower the local authorities to carry out the necessary measures for destroying the locusts.

Departmental notes on insects that affect foresty, No. 1, E. P. Stebbing (*Calcutta: Supt. Govt. Printing, India, 1902, pp. IV + 149, pls. 5*).—In this report the author presents notes on a considerable variety of insects injurious to forest trees in India. An alphabetical list of the chief forest trees is given, with mention of the more important injurious insects under each species. Detailed notes are given on the habits and life history of a large number of insects, among which the following may be mentioned: *Tryxalis nasuta*, *Oxya velox*, *Sinoxylon crassum*, *S. anale*, *Apriona germari*, species of Scolytus, *Trabala vishnu*, *Lymantria ampla*, *L. obsoleta*, *L. todara*, *L. mathura*, *L. bivittata*, *L. grandis*, *Agrotis ypsilon*, *Boarmia selenaria*, *Monophlebus stebbingii*, *M. dalbergiæ*, and *M. tectonæ*. Brief notes are also given on the use of Paris green in spraying trees for the destruction of caterpillars.

Insect enemies of shade trees, E. P. Felt (*Colorado State Bd. Hort. Rpt. 1901, pp. 164–170*).—Economic and biological notes are given on imported elm-leaf beetle, forest tent caterpillar, imported elm bark-louse, gypsy moth, leopard moth, white-marked tussock moth, Antiopa butterfly, cottony maple scale, cottonwood-leaf beetle, and *Saperda calcarata*.

Galls and insects producing them, I, II, M. T. Cook (*Ohio State Univ. Bul., 6. ser., No. 15; reprinted from Ohio Nat., 2 (1902), pp. 263–278, pls. 4*).—The author describes the anatomy of plant galls caused by a number of groups of insects, including plant lice, Phytoptus, Cecidomyia, and Cynipidæ. In this paper galls are classified in two groups, those produced by biting and those produced by oviposition. The anatomical structure of the gall was found to depend upon the genus of the insect which produced it rather than upon the species of plant upon which it was produced.

The chemical composition of insecticides and fungicides, with an account of the methods of analysis employed, J. K. Haywood (*U. S. Dept. Agr., Bureau of Chemistry Bul. 68, pp. 62, fig. 1*).—In cooperation with the Division of Entomology the Bureau of Chemistry collected about 300 samples of insecticides and fungicides, including all the more important ones which are on the market, and of this number 156 were selected for analysis, mainly insecticides. The author describes the methods employed in different classes of these materials, and discusses the results at some length. Except in the cases of Paris green, London purple, whale-oil soap, hellebore, pyrethrum, and tobacco extracts, only single analyses are reported.

In 45 samples of Paris green, "neither the amount of moisture nor sand is in any case sufficient to be objectionable. As to sodium sulphate, which is always present in samples of Paris green on account of the method of manufacture, there is no reason why a sample which had been at all well washed should have more than 1 per cent present. The table shows that 16 of the samples of Paris green have between 1 and 2 per cent, 2 have between 2 and 3 per cent, and one has between 3 and 4 per cent, making a total of 19, or 43 per cent, which have more sodium sulphate than should be allowable. . . .

"The figures for total arsenious oxid show that no green contains less than 56.20 per cent. There are 7 greens containing between 56 and 57 per cent, 24 containing between 57 and 58 per cent, 11 containing between 58 and 59 per cent, and the remaining 3 containing between 59 and 62 per cent. These figures would seem to indicate that there is no reason for a sample of Paris green containing less than 56 per cent of total arsenious oxid, and that the States having laws regarding this subject should change them so as to require the presence of 56 instead of 50 per cent of arsenious oxid.

"The figures for copper oxid vary from a minimum of 27.58 to a maximum of 31.16 per cent. More than half of the samples contain between 30 and 31 per cent.

"If the Eastern and California standard of 4 per cent be adopted for free arsenious oxid, and the 10-day water extraction method be used, there are only 13 samples, or 29 per cent, of the above Paris greens that would pass; but if the 6 per cent limit, which we consider the better, be used, 38 samples, or 84 per cent, of the greens would be accepted. . . .

"The figures representing the soluble arsenious oxid by the sodium-acetate-extraction method seem to show that most supplies of Paris green really contain very little arsenious oxid as such. . . .

"It appears from the work that has been done on the subject that the sodium-acetate method gives more closely the true percentage of free arsenious oxid in the sample of Paris green, while the water-extraction method gives the percentage of free arsenious oxid in the green plus some arsenious oxid obtained by the decomposing action of the water on the Paris green. In some very coarse samples of Paris green, which are supposed not to be made as well as the finer samples, the author found recently that the sodium-acetate-extraction method gave very low figures for free arsenious oxid (showing that only a small amount of free arsenious oxid as such was present), while the water-extraction method gave very high figures (seeming to show that although only a small amount of arsenious oxid was present in the free state, there was present a certain portion of the green, which was in a very loose combination, and consequently was easily broken up). That portion of the green which was in such a loose combination would, in all likelihood, when applied to the plant soon break up and scorch the foliage. It therefore appears that while the sodium-acetate-extraction method, as before mentioned, gives more closely the actual percentage of free arsenious oxid present in the green, the water-extraction method gives some idea of its stability, and consequently will express more closely the value of the compound in actual orchard practice."

It is suggested that in adding lime to Paris green to prevent the scorching of the foliage, it would be better, from a theoretical standpoint, "to mix the green, in suspension in water, with the lime about 10 days before use and stir the mixture occasionally, since the free arsenious oxid does not go into solution in much less time than this, and consequently is not acted upon as well by the lime to form the less harmful compound calcium arsenite."

In 11 samples of London purple, the water varied from 1.87 to 4.9 per cent, and the sand from 1.36 to 9.74 per cent, although the latter was rarely over 3.5 per cent. It was found that the arsenic was not present exclusively as calcium arsenite, but "both as calcium arsenite and calcium arsenate. The amount of these two substances varies very much, but where both the arsenious and arsenic oxids are calculated to arsenic it is found that the percentage of this constituent is fairly constant in different samples." This fact affects the interpretation of the analysis as to the harmfulness of the sample.

"Wherever a sample contains only a small quantity of soluble arsenious oxid it contains a very large quantity of soluble arsenic oxid, so that the total amount of arsenic that is dissolved from any sample of London purple is very great. This perhaps explains the unaccountable manner in which London purple often scorches the foliage when an analysis has shown that only a small quantity of arsenious oxid is present. . . . Where a large part of the soluble arsenic is present as the calcium salts of arsenious and arsenic acid, as shown by the fact that large amounts of lime also go into solution, it appears that plants can endure much more of these salts than they can of the free acids. Work along this line is much needed."

Remedies and formulas adopted by the State board of horticulture for the extermination of pests injurious to tree and plant life (*Colorado State Bd. Hort. Rpt. 1901, pp. 273-292*).—Notes are given on the formulas and methods of preparing the common insecticides, such as Paris green, London purple, white arsenic, arsenic bran mash, white hellebore, Bordeaux mixture, kerosene emulsion, resin wash, lime-salt-and-sulphur wash, and whale-oil soap. A brief description, together with remedies, is given for the chief insect enemies of apple, pear, plum, peach, small fruits, shade trees, roses, and other farm and garden crops.

An index to Bulletins Nos. 1-30 (new series) (1896-1901) of the Division of Entomology, N. BANKS (*U. S. Dept. Agr., Division of Entomology Bul. 36, n. ser., pp. 64*).—In this bulletin the author has compiled an index of authors, illustrations, species of insects, and subjects which are included in Division of Entomology Bulletins 1–30, new series.

Report of the twenty-second annual convention of the Colorado State Beekeepers' Association (*Colorado State Bd. Hort. Rpt. 1901, pp. 309–420, pl. 1*).—The twenty-second session of this association was held at the State capitol building, Denver, Colo., November 18 to 20, 1901. A number of brief papers were read on various subjects, including methods of killing ants, grading honey, breeding bees, growing basswood for bee food, the construction of a honey house, honey pasturage, abnormal swarming, spring management, the extraction of honey, and long-tongued bees.

Studies on the silkworm during the pupal condition, R. DUBOIS and E. COUVREUR (*Ann. Soc. Linn. Lyon, n. ser., 48 (1901), pp. 157–163*).—The investigations reported in this paper were chiefly concerned with the elimination of carbonic acid and water from the pupae, the influence of the presence or absence of the cocoon on the rapidity of the metamorphosis of the pupae, and the influence of carbonic acid on the spinning powers of the larvae. It was found that during the 3 days in which the larva spins the cocoon a large quantity of carbonic acid and water vapor was excreted, while after this period the carbonic acid accumulated to a considerable extent in the tissues.

FOODS—NUTRITION.

Dietary studies in New York City in 1896 and 1897, W. O. ATWATER and A. P. BRYANT (*U. S. Dept. Agr., Office of Experiment Stations Bul. 116, pp. 83*).—The results of 36 dietary studies carried on in the thickly congested districts of New York City are reported. In some cases the families had a fairly large income, but most of them were of the sort receiving frequent assistance from charitable organizations. For convenience in discussing the results the families were divided into 6 groups, viz, those in which the cost of the daily diet per man (1) was less than 13 cts., (2) ranged from 13 to 16 cts., (3) from 17 to 20 cts., (4) from 21 to 23 cts., (5) from 25 to 28 cts., and (6) over 28 cts. The average results obtained follow:

Average results of dietary studies made in New York City.

[Amounts per man per day.]

	Number of families.	Cost.	Protein.	Fat.	Carbohydrates.	Fuel value.
		Cents.	*Grams.*	*Grams.*	*Grams.*	*Calories.*
Group 1	10	11	75	79	271	2,151
Group 2	19	15	94	102	352	2,779
Group 3	8	18	103	120	342	2,944
Group 4	9	22	125	138	420	3,514
Group 5	7	26	138	154	456	3,864
Group 6	6	38	178	222	643	5,432

According to the authors, in some instances the income was so limited that it was too small for the purchase of a sufficient amount of nutritious food. Although some of the families made good use of their resources, in a majority of cases it is believed that they would have been benefited by instruction regarding the purchase, selection, and preparation of food.

"Certain it is that improvements in the selection of food so as to secure more and better nutriment at less cost, in the cooking so as to make palatable dishes from inexpensive materials, and in the setting of the table so as to make it an attractive feature of home life, will be important means for the material and moral uplift of families like those whose dietary practice is described in this and the previous report." (E. S. R., 9, p. 1074.)

Practical dietetics, W. G. Thompson (*New York: D. Appleton & Co., 1902, 2. ed., pp. XXIV + 828, pls. 9, fig. 1*).—The author states that this volume has been revised throughout and in part rewritten, and that considerable new matter has been added. As a whole the book treats of the nutritive value of different foods and food preparations, stimulants, beverages, and condiments; cooking food; digestion; diet in relation to different diseases; diet for prisons, asylums, etc.; and related topics.

The complete Indian housekeeper and cook, Flora Annie Steel and Grace Gardiner (*London: W. Heinemann, 1902, 3. ed., pp. XIV + 373*).—This volume is designed as a guide for English housekeepers in India. Such subjects are treated of as horse and stable management, cows and dairy, poultry, and gardening, though the bulk of the volume is devoted to food and its preparation, household management and hygiene, and related topics. The authors state that this edition has been revised and corrected.

Origin and preparation of the most important food materials and condiments, E. Seel (*Gewinnung und Darstellung der wichtigsten Nahrungs- und Genussmittel. Stuttgart: F. Enke, 1902, pp. VII + 478*).—It has been the author's purpose to discuss the origin, method of manufacture, preservation, uses, regulations regarding the sale, etc., of the more important animal and vegetable foods and beverages. The volume is designed as a text-book and work of reference for chemists, pharmacists, physicians, and those interested in legal chemistry.

Comparative studies of the composition of beef from different regions of France and the colonies, Busson (*Monit. Sci., 4. ser., 15 (1901), pp. 597–609; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 20, pp. 980–982*).—Analyses are reported of a large number of different cuts of beef, from France and the French colonies, the study being undertaken with special reference to canning meat for the French army. The author also reports figures showing the amount of cooked meat obtained with the different sorts of beef studied.

Tenderness of meat and its relation to the thickness of the muscle fibers, L. Isaak (*Inaug. Diss., Würzburg, 1901, pp. 13; abs. in Ztschr. Fleisch u. Milchhyg., 12 (1901–02), pp. 175–177*).—The author examined the flesh of 3 steers and 2 calves with a view to learning the connection between muscle fibers and tenderness. His principal conclusions follow:

The muscle fibers of a full grown steer are 2 to 2.5 times thicker than those of the calf. The thickness of the fibers does not exert any direct effect upon the tenderness of the flesh. The thickness of the fillet and flank was not proportional to the tenderness of the flesh. The author believes that possibly the connective tissue determines the tenderness though this is not proven. He suggests further that differences in the structure of the muscle fibers, in the thickness of the sarcolemma, or in the chemical composition of the sarcoplasma have an effect upon the tenderness of meat.

Study of a new proteid preparation "Proton," E. O. Hultgren (*Skand. Arch. Physiol., 13 (1902), No. 1–2, pp. 144–169*).—Analyses of Proton (a food prepared from milk casein) and Proton bread, as well as the results of digestion and metabolism experiments undertaken to determine the nutritive value of Proton, are reported. A bibliography of the literature of artificial proteid foods is included.

Studies with the Egyptian fermented milk called leben, E. Rist and J. Khoury (*Ann. Inst. Pasteur, 16 (1902), pp. 65–84; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No 18, p. 872*).—The micro-organisms causing the peculiar fermentation of leben, a fermented beverage made from milk, were studied.

Buttermilk as an infant food, A. Baginsky (*British Med. Jour., 1902, No. 2175, pp. 692–694*).—The successful use of buttermilk in the feeding of infants is discussed on the basis of the author's hospital experience. The buttermilk is prepared as follows: "To 1 liter 15 to 25 gm. of wheat flour and 35 to 50 gm. of cane sugar are added. With constant stirring it is allowed to boil for at least 2 minutes (as a rule we allow the mixture to boil up 3 or 4 times). The milk is then poured into bottles which have been previously sterilized, stoppered by means of cotton, and kept in the ice box until used."

Manufacture of semolina and macaroni, R. P. Skinner (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 20, pp. 31, pls. 5, figs. 6*).—The possibility of the profitable production of true Durum wheats in America suitable for making semolina and Italian pastes is discussed, and the manufacture of such goods described.

Concerning the water content of bread, Walter (*Schweiz. Wchnschr. Chem. u. Pharm., 40 (1902), p. 75; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 14, p. 667*).—The author's analyses confirmed the estimate of 40 per cent as the maximum water content of Swiss bread.

Concerning a new bread rich in cellulose, R. Barany (*Wiener Med. Wchnschr., 52 (1902), p. 411; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 14, p. 668*).—Experiments are reported on the use of bread rich in cellulose as a remedial agent in constipation, corpulence, and diarrhea.

Chemical and sanitary studies of bread sold in Jurjew, J. F. Masing (*Inaug. Diss., Jurjew, 1901; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 14, pp. 667, 668*).—Analytical data are reported.

Sandy bread, H. Kreis (*Ber. Kanton. Lab. Basel-Stadt, 1901, p. 8; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 14, p. 667*).—The amount of sand in a sample of bread was estimated.

Hygienic studies of flour and bread. X, New studies on the acidity of bread, its cause, and methods of estimating it, K. B. Lehmann (*Arch. Hyg., 44 (1902), No. 3, pp. 214–237*).—According to the author, that portion of the acid material of bread which is insoluble in ether is largely soluble in water. The water-soluble portion contains much phosphoric acid, probably potassium monophosphate.

The slight acidity of the bread, after extraction with ether and water, according to the author, may be referred to proteids present. Provided bread was cooled and covered, the acidity did not increase on standing. Methods of estimating the acidity of bread are discussed.

Concerning the differences in composition of low and high milling products, L. Lindet (*Jour. Pharm. et Chim., 6. ser., 14 (1901), pp. 433–437; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 14, pp. 665, 666*).—On the basis of the data reported, high milling is, according to the author, preferable to low milling.

Some methods of estimating the value of flour, P. G. Ivanov (*Inaug. Diss., St. Petersburg, 1901; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 14, p. 666*).—The comparative value of different methods of examining milling products was studied.

Banana flour (*Nouveaux Remèdes, 17 (1901), p. 121; Chem. Ztg., 25 (1901), Repert., p. 116; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 14, p. 667*).—An analysis of flour made from Jamaica bananas is quoted.

Yams (Ipomœa batatas), L. Bonnin (*Bul. Assoc. Chim. Sucr. et Distill., 18 (1900), pp. 1028, 1029; abs. in Ztschr. Untersuch Nahr. u. Genussmtl., 5 (1902), No. 8, p. 368*).—The chemical composition of yam flour, the vines, and residue from the manufacture of yam starch is reported. The vines are used as a feeding stuff for milch cows.

The legal regulations governing the sale of edible fungi in the Munich markets, K. Giesenhagen (*Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 14, pp. 593–603*).—Regulations governing the sale of edible fungi are discussed.

Estimating the value of fig coffee, O. von Czadek (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 5, pp. 761–763*).—Analytical data are reported and discussed.

Do the volatile bodies of tea and coffee affect the respiration of man? K. B. Lehmann and G. Rohrer (*Arch. Hyg., 44 (1902), No. 3, pp. 203–213*).—So far as could be observed in experiments which are reported in full, neither tea nor coffee distillate had any noticeable or lasting effect upon the rate of respiration.

Experiments on the effect of muscular work upon the digestibility of food and the metabolism of nitrogen, C. E. Wait (*U. S. Dept. Agr., Office of Experiment Stations Bul. 117, pp. 43*).—Continuing earlier work (E. S. R., 13, p. 72), a number of experiments on the effect of muscular work on the digestibility of a mixed ration and the metabolism of nitrogen are reported. Under the experimental conditions neither factor was influenced by the muscular work performed. The author also studied the possibility of determining the composition of a simple mixed diet from the analysis of composite samples of it, the results obtained being favorable to this method.

The physiological effects of route marching, N. Zuntz and Schumburg (*Physiologie des Marsches. Berlin: August Hirschwald, 1901, pp. XVI+ VIII+ 361, pl. 1, figs. 46*).—To study the physiological effects of marching, a large number of experiments were carried on with 5 military students over a course of 24.75 kilometers, the maximum load which they carried being 31 kg.

The effect of muscular exertion (motion of forward progression and in addition carrying a load) upon the action of the heart, upon the liver, the condition of the blood, the vital capacity of the lungs, the elimination of nitrogen by the skin and kidneys, and the metabolism of nitrogen was studied, as well as the respiratory quotient. It was found that the elimination of nitrogen by the skin and kidneys was not markedly increased by the marching. When an increase did occur it was most noticeable on the day following that in which the muscular work was performed. The average amount of nitrogen eliminated in the perspiration was found to be 0.284 gm. per liter, the amount of nitrogen diminishing as the amount of perspiration increased. Marching had little effect upon the composition of the feces and the digestibility of the food, which consisted of a simple mixed ration. In the tests in which the respiratory changes were studied, 2 of the subjects marched on a sort of treadmill, which inclined upward slightly.

From a study of the results obtained the authors calculate that for motion of forward progression one of the subjects required 509.3 calories per kg. of body weight per 1,000 meters of the distance covered, and 7.5535 calories per kilogram-meter for the work of lifting the body. Similar values for the second subject were 527.14 calories and 7.487 calories. The conclusion was drawn that, generally speaking, the energy expended in walking is very nearly proportional to the mass moved forward; but under favorable circumstances, of which perhaps the most important is that the load carried be properly distributed, the body plus the load is moved with a smaller proportional expenditure of energy than the body without the load.

During marching the authors calculate that the energy expended would produce an amount of heat sufficient to raise the body temperature 1° in 8.7 minutes. Nevertheless, the temperature was raised only 1 to 1.5° C. after the heaviest marching, the extra heat being carried off largely by the increased elimination of water through the skin.

The authors believe that the observed changes in the respiratory quotient show that the carbohydrates in the body are quickly used up, leaving the fats as the energy-yielding material. Other observations are discussed at length in relation to the clothing and diet of soldiers and their physical health, etc. The book also contains a historical and critical review of earlier experiments on the general subject of marching considered as a form of muscular work.

The digestibility of foods in the stomach with special reference to hygiene, C. Fermi (*Arch. Anat. u. Physiol., Physiol. Abt., 1901, Sup., pp. 1–83; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 20, pp. 975, 976*).—The greater number of the author's experiments with foods were made with dogs and pigs, and a small number with man. Many deductions are drawn regarding the comparative digestibility of foods and related topics.

Heat of combustion and physiological nutritive value of foods. II, The nutritive value of meat extract, J. Frentzel and N. Toriyama (*Arch. Anat. u. Physiol., Physiol. Abt., 1901, pp. 499–512; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 20, p. 983*).—According to these authors, some two-thirds of the energy of albumin-free meat extract is available for the body.

Concerning the effect of sunlight upon the gaseous exchange in man, H. Wolpert (*Arch. Hyg., 44 (1902), No. 4, pp. 322–338*).—A number of experiments are reported and discussed.

The harmfulness of boric acid as a food preservative, J. Kister (*Ztschr. Hyg. u. Infectionskrank., 37 (1901), p. 225; abs. in Hyg. Rundschau, 12 (1902), No. 9, pp. 463, 464*).—Experiments with animals led to the conclusion that boric acid was harmful.

Review of the literature of foods for the year 1900, A. J. J. Vandevelde (*Repert. Geschr. Voedingsmiddel., 1900, pp. 140*).—A large number of titles of publications on the general subject of foods and food products are included in this volume, bibliographical data being accompanied in most cases by notes regarding the ground covered by the publications cited.

Review of articles on foods published during the year 1901, A. J. J. Vandevelde (*Repert. Geschr. Voedingsmiddel., 1901, pp. 165*).—This is the second annual volume reporting titles of articles on analytical methods, water, milk and cream, bread and flour, sugar, and related topics. In most cases the bibliographical data are accompanied by brief notes regarding the scope of the articles cited.

ANIMAL PRODUCTION.

Feeding value of different forage plants, R. Dumont (*Prog. Agr. et Vit.* (*Éd. L'Est*), *23* (*1902*), *Nos. 19, pp. 553–557; 21, pp. 610–612; 22, pp. 637–642*).—The comparative feeding value of natural meadows, annual leguminous plants, grasses, and less common forage plants and mixtures is discussed.

Feeding animals; brewers' grains and malt, F. Weber (*Jour. Agricole* [*Paris*], *13* (*1902*), *No. 149, pp. 143–148*).—The nutritive value of these feeding stuffs is discussed.

The utilization of the by-products of malting and brewing, A. Van Roost (*Rev. Gén. Agron.* [*Louvain*], *11* (*1902*), *Nos. 4, pp. 220–224; 5, pp. 249–253*).—The utilization of by-products of malting and brewing as feeding stuffs and fertilizers is described.

Cakes from oil-bearing seeds, L. Bussard and G. Fron (*Ann. Sci. Agron., 1901, II, No. 1, pp. 117–160*).—The authors describe the principal sorts of cakes from oil-bearing seeds, and methods of studying their value with the aid of the microscope, etc.

Sugar and muscular energy, L. Grandeau (*Jour. Agr. Prat., n. ser., 4* (*1902*), *No. 32, pp. 174–176*).—The value of sugar as a source of energy for muscular work is discussed, a number of experiments, especially those of Steinitzer, which were favorable to this use of sugar, being quoted.

Molasses in mixed feeds, H. Van de Venne (*L'Ing. Agr. Gembloux, 12* (*1902*), *No. 9, pp. 437–448*).—The composition of a number of molasses feeds is quoted, and their nutritive value discussed.

The feeding value of beet pulp, B. C. Buffum and C. J. Griffith (*Colorado Sta. Bul. 73, pp. 3–10*).—On the basis of data recorded in station bulletins and Department of Agriculture publications, the authors discuss the feeding value of beet pulp with special reference to local conditions. The results obtained by some practical feeders are briefly noted.

The feeding of farm animals, H. J. Patterson (*Maryland Sta. Bul. 84, pp. 155–193*).—The principles of animal nutrition are discussed and tables are given which show the composition of digestibility of some common feeding stuffs. The author also discusses rations for different animals, the methods of computing rations, and related topics.

Animal breeding, T. Shaw (*New York and Chicago: Orange Judd Co., 1902, pp. XII + 406, pl. 1, figs. 7*).—The author discusses the principles of animal breeding and related topics, the information being arranged so that the volume may be used as a text-book.

Session of Improved Live Stock Breeders' Association (*Missouri State Bd. Agr. Rpt. 1902, pp. 339–372*).—Papers presented at this association's meeting are included in this report.

The rearing of calves on milk substitutes, H. Hayward (*Pennsylvania Sta. Bul. 60, pp. 12, pls. 2*).—The results of feeding milk substitutes to 13 calves are reported. A number of other calves which were included in the test died, either before a successful substitute for milk had been found or from some cause not attributable to the experiment.

Various combinations of flour, flaxseed meal, linseed meal, sugar, glucose, cocoanut meal, dried blood, fenugreek, and fennel seed were tested in a preliminary way. According to the author, "all of the kinds of sugar tried seemed to have a bad effect upon the bowels, so much so that the attempt to use sugar in the ration was soon abandoned. Fenugreek and fennel seed did not seem to produce an effect that would warrant their use as part of the meal. Flaxseed meal, on account of its laxative properties, was not employed in the first successful combination adopted, but a small proportion of it was added in the second meal, used in the later part of the trials."

Two substitutes for milk were finally determined upon. The first was made up of 3 parts of wheat flour, 2.5 of cocoanut meal, 2 of Nutrium, 1 of linseed meal, and 0.2 of dried blood. One pound of this mixed meal was added to 6 lbs. of hot water, and after stirring a little was allowed to cool to 100° F., when it was fed from a pail or calf feeder, the latter method being regarded as preferable. The second mixture, which was regarded as somewhat inferior to the first, was made of 1.03 parts of corn meal, 2 of Nutrium, 0.15 of flaxseed, 0.2 of dried blood, 3 of flour, 0.6 of cocoanut meal, and 0.6 of sifted oat chop. For purposes of comparison 2 calves were fed in the usual way on skim milk. The length of the feeding period varied with the different calves. . The gains made by each calf are reported.

The author states that the calves were fed on an average 7.6 lbs. of meal for 7.7 days. For 5 days they consumed on an average 5.4 lbs. of milk and 0.77 lb. of meal. For 83.4 days on an average they were fed meal mixture only, consuming on an average 2.17 lbs. each. In several cases a little milk was fed after the calves had been accustomed to the mixed-meal ration. According to the author—

"The calf meal is not as satisfactory a food as whole milk for very young calves, and it is quite likely that for the first few weeks upon this ration the calf does not have the vigor or power of resistance that it would have if fed upon its natural food. As a consequence, calves that are to be raised upon a milk substitute should have provided for them warm and dry quarters that will keep the animal comfortable at all times. This feature of raising calves can not be too strongly emphasized.

"From the results of these trials the following conclusions seem warranted: There is little difficulty in raising prime dairy calves without milk after they are 2 weeks old. The cost of raising calves on a milk substitute up to the time they can be put on a hay and grain ration, or when they are between 3 and 4 months of age, need not exceed $10, exclusive of care. Calves from high-class, well-bred dairy stock when raised in this way are worth much more than they cost, and afford the only means by which a milk dairyman can raise his herd to a high standard of excellence."

In connection with the above experiments the composition of Nutrium was determined.

Baby beef, H. M. COTTRELL (*Kansas Sta. Bul. 113, pp. 39–49*).—The comparative value of alfalfa hay, prairie hay, corn, Kafir corn, and soy beans for the production of baby beef—that is, well-fattened young cattle—was tested. For this purpose 130 calves, which had just been weaned, were divided into 6 lots and fed for a period covering 7 months. The following table shows the results obtained:

Average results of feeding tests with young cattle.

Rations fed.	Average gain per animal in 7 months.	Grain eaten per pound of gain.	Hay eaten per pound of gain.
	Pounds.	*Pounds.*	*Pounds.*
Alfalfa hay and corn	407	4.70	5.44
Alfalfa hay and Kafir corn	379	5.24	6.26
Prairie hay with corn and soy beans, 2:1	378	5.20	4.86
Prairie hay with Kafir corn and soy beans, 2:1	342	5.94	5.39
Alfalfa hay and corn following skim milk	440	4.39	4.36
Alfalfa hay and corn following whole milk	404	4.70	4.20

Thirty-two of the animals were steers. These averaged 838 lbs. in weight at the conclusion of the trial, and sold for $5.40 per hundred. Of the heifers, 74 averaged 758 lbs. in weight, and sold for $5.35 per hundred, and 18 averaged 741 lbs. in weight, and sold for $5.15 per hundred. The author notes that the amount of food required per pound of gain in fattening young animals is comparatively small; furthermore, that the heifer calves made practically as high returns as the steers.

"The calves used in this experiment were 'common bred' ones, and they made good gains. The farmer whose business was producing baby beef would use the best type of bull that he could secure—short-legged, thick-meated, blocky, and quick-maturing." He would select well-bred cows of strongly pronounced beef type that were good milkers. "With good breeding and good feeding an average weight of 1,000 lbs. may be secured at 12 to 14 months of age."

Results of a cattle-feeding test, W. J. Kennedy and F. R. Marshall (*Iowa Sta. Bul. 66, pp. 223–255, figs. 10*).—This was a cooperative experiment conducted at the Brookmount Farms. Using 11 lots of 20 steers each, averaging 1,043 lbs. in weight, the authors studied the value of condimental stock feeds, corn by-products, cotton-seed meal, linseed meal, and dried blood when fed in addition to corn, and also the advisability of changing cattle on a full grain ration from dry food to pasture.

At the beginning ot the test, which covered 92 days, all the lots were fed 15 lbs. per head daily of snapped corn (on the ear), with wheat straw in addition. As the test progressed shelled corn, corn-and-cob meal, and finally corn meal were substituted for the snapped corn. During the test, considered as a whole, snapped corn, shelled corn, corn-and-cob meal, corn meal, and wheat straw were fed to all the lots in about the proportion of 2 : 1 : 5 : 10 : 10. Lot 1 was fed the basal ration only. In addition to the basal ration, lots 2 to 6 were fed at the beginning of the trial 2 oz. per head daily of oil meal, cotton-seed meal, gluten meal, Buffalo gluten feed, and germ-oil meal, respectively; lot 7 was fed 0.1 lb. of dried blood; lots 8 to 10 were fed respectively 0.4 oz. of Iowa Stock Food, International Stock Food, and Standard Stock Food. Lot 11 was not fed any concentrated feed in addition to the basal ration, but after 6 weeks was allowed the run of a 21-acre timothy pasture. All the amounts fed were increased as the test progressed until the cattle were on full feed, which required about 5 weeks. After 42 days feeding the steers fed cotton-seed meal (lot 3) became suddenly sick. Three of the animals died and the rest becoming blind and refusing to eat were marketed and the test with this lot discontinued. A post-mortem examination of the steers which had died showed that the stomachs "were very much inflamed, being red and blue in color."

The test progressed regularly with the other lots, except that on account of accidents 1 steer was removed from lots 1, 4, and 5. The steers were sold in Chicago, the price received ranging from $7 in the case of lot 10 (Standard Stock Food) to $7.65 per 100 lbs. in the case of lot 4 (gluten meal). The following table summarizes the principal results obtained including those of the slaughter test:

Results of a steer-feeding test.

Rations fed.	Average daily gain per steer.	Cost of feed per pound of gain.	Average net profit per steer.	Shrinkage in shipping.	Proportion of dressed to live weight.	Shrinkage in cooling carcass.	Loose fat.	Weight of hide.	Value returned per bushel of corn.
	Lbs.	*Cts.*		*Lbs.*	*Per ct.*	*Per ct.*	*Per ct.*	*Lbs.*	
Lot 1, corn (basal ration)	2.39	10.71	$14.49	55	58.8	2.1	4.8	77.1	$0.93
Lot 2, corn and oil meal	2.51	11.02	14.85	54	60.6	1.8	6.1	76.2	.95
Lot 4, corn and gluten meal	2.92	9.34	17.99	62	59.6	1.4	5.2	81.7	1.04
Lot 5, corn and Buffalo gluten feed	2.88	9.65	17.60	51	60.6	1.8	5.8	79.0	1.03
Lot 6, corn and germ oil meal	2.32	11.64	12.16	65	60.3	1.9	5.4	75.1	.885
Lot 7, corn and dried blood	2.42	11.08	15.36	68	59.5	1.9	6.1	77.1	.96
Lot 8, corn and Iowa Stock Food	2.30	10.51	13.09	60	59.6	1.8	5.6	74.9	.925
Lot 9, corn and International Stock Food	1.97	13.41	6.33	71	59.6	1.9	5.8	73.5	.72
Lot 10, corn and Standard Stock Food	2.17	11.95	5.52	68	58.7	1.9	5.0	74.7	.705
Lot 11, corn and pasturage	2.49	10.20	14.97	90	59.3	1.9	6.1	78.1	.97

At the beginning of the trial 20 pigs, averaging 142 lbs. each in weight, followed each lot of steers, receiving no feed in addition to what they could gather. The gains made were small and at the end of 8 weeks the number in each case was diminished to 10. The pigs were not in good condition for market at the close of the test and were marketed later. Omitting data for the cotton-seed meal lot (No. 3) the total amount gained by the 10 lots of pigs was 506, 465, 362, 427, 435, 540, 435, 525, 397, and 707 lbs., respectively. The small gain made by lot 3 is explained by the fact that the cotton-seed-meal steers, which they followed, were fed only a part of the test.

Analyses are reported of the feeding stuffs used in the tests. Definite conclusions are not drawn from this trial, as according to the authors further experiments are needed. It is purposed to continue this line of investigation.

Quality in beef, H. M. Cottrell and V. M. Shoesmith (*Kansas Sta. Bul. 111, pp. 24, pls. 15, fig. 1*).—Six steers were fed and slaughtered for the purpose of demonstrating to a class of students the effects of breeding, form, etc., on the quality of beef produced. Two of the steers were of the beef breeds, 2 dairy breeds, and 2 scrubs. During the whole test, which covered 205 days, the steers were fed corn, corn chop, and alfalfa hay. The Shorthorn and the 2 scrubs weighed about 1,050 lbs. each at the beginning of the test and the other steers on an average about 875 lbs. The average results of the test follow:

Average results of feeding steers of different types.

Type of steer.	Total gain.	Corn eaten per lb. of gain.	Alfalfa hay eaten per lb. of gain.	Percentage of dressed beef.	Percentage of tallow.	Percentage of hide.	Cost of feed per lb. of gain.	Value of dressed carcass per lb.
	Pounds.	*Pounds.*	*Pounds.*	*Per cent.*	*Per cent.*	*Per cent.*	*Cents.*	*Cents.*
Shorthorn	395	9.78	5.46	63.5	5.0	6.0	3.75	8.50
Angus	288	11.38	5.04	62.6	4.2	6.9	3.75	7.50
Jersey	348	9.36	5.98	59.5	7.6	7.0	2.85	8.00
Holstein	411	8.16	5.08	59.6	4.5	6.7	3.25	7.75
Scrub, red	435	7.70	4.91	59.8	4.0	6.4	3.25	7.50
Scrub, spotted	306	10.43	6.92	59.7	5.2	6.1	3.25	7.00

The beef was cut up by the Kansas City method. The authors state that the beef-grade steers (the Shorthorn and Angus) furnished 27.8 per cent of the high-priced cuts, viz., loin and rib, the dairy grades (Jersey and Holstein) 27.5 per cent, and the scrubs 26.7 per cent. There was a loss to the slaughterers in every case unless the value of the offal was taken into account. In the opinion of those making the test the beef from all the steers was of good flavor, ranking in this respect about in the order of the prices at which the dressed carcasses were valued.

"This trial shows what every careful test has shown, that steers of the dairy breeds, properly fed, will make good beef—beef better than that usually found on the market but not of as high quality as that secured from well-bred special beef animals."

Fattening steers without hogs to follow, H. M. Cottrell and J. G. Haney (*Kansas Sta. Bul. 112, pp. 25–36, pls. 2*).—According to the authors pigs can not profitably be employed, owing to losses from hog cholera, to follow cattle and utilize the waste which attends the ordinary methods of feeding. A test covering 116 days was, therefore, undertaken to learn whether the steers would not utilize ground grain and cut hay more economically than ordinary feeding stuffs, 4 lots of 20 steers each, averaging 1,036 lbs. in weight, being used. Lots 1 and 2 were fed shelled corn and lots 3 and 4 corn meal, lots 1 and 3 receiving whole alfalfa hay and lots 2 and 4 alfalfa hay cut into inch lengths. The alfalfa hay was gradually substituted for prairie hay. After 11 weeks soy-bean meal was fed to all the steers for 26 days, as much as 4 lbs. per head daily being given during a part of the time. This feed caused excessive scouring and was dropped. The average daily gains with steers was: Lot 1, 2.26 lbs.; lot 2, 2.21; lot 3, 2.35, and lot 4, 2.52 lbs. The grain eaten per lb. of gain was 7.89, 7.71, 7.56, and 6.8 lbs. respectively, and the hay, 4.09, 3.87, 4.01, and 3.45 lbs. respectively. During the period in which soy beans were fed the steers made an average daily gain of 1.16 lbs., 30.79 lbs. of grain and 0.87 lbs. of hay being required per pound of gain. The steers were sold and slaughtered, the dressed weight being on an average 59.3 per cent of the live weight. The yield of fat was 6.7 per cent. "The steers having corn meal made 8.8 per cent more gains and ate 7.95 per cent less grain and 6.28 per cent less hay than those fed whole corn." The calculated saving in grinding would range, according to the authors, from 1.59 cts. per bushel when corn is worth 20 cts. to 4.77 cts. when it is worth 60 cts. a bushel.

"The steers fed cut hay made 2.6 per cent more gains and ate 6.08 per cent less grain and 9.63 per cent less hay for each 100 lbs. of gain than those fed whole hay. This indicates that if the feeder has the machinery it will pay to cut the hay, but for a small lot of steers it will not pay to buy cutting machinery to be used only for cutting hay for the steers."

The authors believe that grinding grain and mixing it with cut hay is of benefit since the animals spend more time in chewing the feed, and that owing to this and its mechanical condition it is in a more favorable form for digestion. Scouring was not observed with this method of feeding.

"One of the writers of this bulletin has just inspected 270 head of year-old calves that were being forced for baby beef. These calves were eating 3 lbs. of cotton-seed meal each per day, in addition to a heavy ration of corn meal. The grain was thoroughly mixed with cut alfalfa hay when put in the feed boxes. Not a single calf was found that showed any signs of looseness, and the droppings were of the most desirable character. An inspection of 1,800 head of fattening steers that were being rapidly forced for 100 days' feeding showed the same condition of bowels—no scouring, and normal condition of the droppings. . . .

"Feeders on this high-priced land will have to do what manufacturers have already done—more thoroughly utilize the materials which they handle. With the old methods, a large portion of the corn was not digested by the steer, and this kept him in an unhealthful condition. The old methods gave 4.5 to 5.5 lbs. of gain from a bushel of corn. The best method used in this experiment gave more than 8 lbs. of gain per bushel of corn."

In discussing the substitution of alfalfa hay for other hay the authors have found that "when stock has not been accustomed to eating alfalfa hay, full feeding of it induces scours. We usually take 30 days to get either horses, steers, or dairy cows on full feed of alfalfa hay, and when this is done there is no trouble in feeding it. While getting stock on full feed of alfalfa, either prairie or timothy hay or straw may be fed."

Beef cattle, W. L. HUTCHINSON and E. R. LLOYD (*Mississippi Sta. Bul. 76, pp. 24, figs. 19*).—Data are given regarding the station herd, the cost of feed for cows and calves, the value of the calves fed, characteristics of the breeds of cattle kept, the value of the manure with especial reference to the cotton-seed products eaten, and related topics. The station herd has been kept on a pasture some 7 months of the year and fed during the winter, from 135 to 150 days principally on cotton-seed meal and hulls. The calves have been allowed to run with their dams and to have all the milk as soon as they could drink it. Provided the pasture is good "it is an easy matter to have the calves weigh over 500 lbs. when they are 12 months old." The average weight of 5 steer calves 1 year old was 589 lbs. and of 5 heifer calves 525 lbs.

To compare the influence of breeding upon profitable feeding 2 grade Angus calves and 2 native calves were given the same treatment until 2 years old. During the summers they were pastured, running with their dams the first year. They were finished on a mixture of cotton-seed meal and corn chop, supplemented by cotton-seed hulls, no other coarse fodder being fed. They were sold for slaughtering at 4.75 cents per pound live weight. The average weight of the grade steers was 970 lbs. and of the native steers which were a little older 1,067 lbs. The percentage of the different cuts in both lots of steers is recorded. "The native steers dressed 60 per cent.; the grades, 60.4 per cent. The natives made as good gains as the grades and gave as large amounts of the choice cuts."

In a brief account of a test of the desirability of giving additional feed to calves running with their dams, the authors emphasize the fact that small animals require less feed for maintenance than large ones, and that young animals may be more profitably fed than those which are older and heavier. Four calves 7.5 to about 9 months old, weighing on an average 419 lbs., were fed during the winter. The feed consumed by the calves cost $20.07, and that eaten by their dams $36. The average daily gain of the calves was 1.73 lbs. Three calves with their dams, but given no feed in addition, made a daily gain of 1.54 lbs.

In discussing feeding under local conditions the authors state that the determinations of the relative value of feeds at the station "show that a ton of cotton seed will produce about one-sixth more beef than a ton of corn, and a ton of cotton-seed meal will produce twice as much. Cowpea hay and Johnson-grass hay are about equal in value. One and a half pounds of corn stover are about equal in value to 1 pound of cowpea hay. The cotton-seed hulls that we have been using this season are nearly equal in value to good Johnson-grass hay—12 lbs. of the hulls giving as good results as 10 lbs. of hay."

Regarding pasturage, oats sown in the early fall on cotton land where there was more or less Johnson grass furnished excellent pasturage the following summer for a limited number of cattle. Bermuda and white clover hay in the valley land and lespedeza on the upland have furnished the principal grazing. "Other grasses that have furnished some grazing are redtop, orchard grass, large water grass, turf oats, and hairy vetch. . . .

"Some of our young animals have gained as much as 400 lbs. during the grazing period, others have gained from 200 to 300 lbs. Our conditions have not been such as to enable us to determine the average gains that should be gotten during a pasture period, but it should not be less than 200 lbs. for each animal."

Fattening steers with different quantities of grain, R. S. SHAW (*Montana Sta. Bul. 35, pp. 15–19*).—To study the relative merits of light, medium, and heavy grain rations, supplemented by leguminous hay, 3 lots of steers were fed for 85 days, the experimental period being preceded by a preliminary period of 24 days and followed by a supplemental period of 14 days. During the latter period the object was simply to maintain the steers in weight until a favorable opportunity occurred for marketing. The preliminary period was necessary in order to get the steers on full feed after dehorning them. Lots 1 and 2 contained 7 animals each, and lot 3 contained 8. All the steers were fed clover hay and barley meal, consuming respectively 19.3, 19.4, and 19.8 lbs. per head daily of the former, and 5.0, 6.73, and 8.9 lbs. of the latter. At the beginning of the experiment proper the average weight of the steers in the 3 lots was 6,850, 7,240, and 9,080 lbs. The average daily gain per head was 2.33, 2.26, and 2.23 lbs., respectively, the feed eaten per pound of gain being 10.4, 11.5, and 12.9 lbs., and the cost of a pound of gain 4, 4.81, and 5.80 cts. The steers were sold at a net profit of $7.66 per head. According to the authors this sum does not represent the total profit, as the value of the feed was estimated at local market prices which were much above its actual cost. The conclusions drawn follow:

"Because of the quality of Montana-grown food products and the favorable climatic conditions during the winter feeding period, maximum returns can be secured from a minimum amount of food. In fattening steers, when alfalfa and clover are used, not more that ½ lb. of grain to the hundredweight of live weight is necessary to produce the most satisfactory results. Contrary to local impressions, some grain must be used throughout a period not less than 120 days in order to get a good finish."

Bullock feeding experiment (*Midland Agr. and Dairy Inst. [Kingston] Rpt. 1901, pp. 71–76*).—A test was made with 3 lots of 2 steers each of the relative merits of undecorticated cotton-seed cake and linseed cake, 1: 1; ground decorticated cotton-seed cake and maize meal, 1 : 1 : 2, and undecorticated cotton-seed cake, in every case supplementing a ration of Swedish turnips, chaffed barley straw, and hay. For 15 days before the test proper began the grain ration of all the steers consisted of undecorticated cotton-seed cake. The test as a whole covered 124 days. The average gain per head in the 3 lots was 2.18, 2.1, and 1.73 lbs., respectively. Taking into account both the gains made and the profits per lot, the conclusion is reached that there is very little profit in feeding the steers and that the differences in gains made are not marked enough to warrant any deductions.

Cattle raising, H. Werner (*Die Rinderzucht. Berlin: Paul Parey, 1902, 2. ed.; rev. in Jour. Landw., 50 (1902), No. 2, pp. 176, 177*).—It is stated that this well-known work has been thoroughly revised.

Polled cattle (*Kansas State Bd. Agr. Quart. Rpt. 1902, Sept. 30, pp. 189, figs. 37*).—This bulletin contains a number of statistical and descriptive articles by different authors on Aberdeen-Angus, Galloway, Red Polled, and Polled Durham cattle.

Study of the races, varieties, and crosses of French cattle, de Lapparent (*Bul. Min. Agr. [France], 21 (1902), Nos. 1, pp. 177–243; 2, pp. 322–394*).—A descriptive and statistical article.

Comparative results from feeding lambs, 1-year wethers, 2-year wethers, and aged ewes, R. S. Shaw (*Montana Sta. Bul. 35, pp. 1–14, figs. 2*).—The relative profits obtained in feeding sheep of different ages under local conditions was tested with 4 lots, comprising, respectively, 55 lambs, 51 year-old wethers, 53 2-year-old wethers, and 53 old ewes. All the lots were fed 0.68 lb. unground barley per head daily in addition to clover hay, the amount eaten in the different lots being 2.05, 3.77, 4.05, and 2.33 lbs., respectively. The average weight of the animals in the 4 lots at the beginning of the test was 62.9, 94.9, 115.7, and 91.6 lbs., respectively. In the 88 days covered by the test the average gains per head were: Lambs, 23.7; yearling wethers, 23.5; 2-year-olds, 24.3, and old ewes, 15.6 lbs. The dry matter eaten per pound of gain was 10.16, 16.6, 17.1, and 17.5 lbs., and the average cost of a pound of gain in the 4 lots was 4.18, 5.83, 5.90, and 6.78 cts., respectively. All the lots were sold in Chicago, the lambs yielding a profit of $1.73, the yearlings $1.40, the 2-year-olds $1.57, and the old ewes 1.8 cts. per head. During transportation the shrinkage in weight in the case of the ewes was 11.3 per cent and in the case of the other lots it was very nearly equal, averaging 8.6 per cent. According to the author—

"The feeding of lambs for market is more profitable than wethers or ewes, providing the ration is so adjusted as to give their rapid increase a finish. Owing to the growthy tendency of the lamb, its ration must possess more fat-producing material than the mature sheep. Where grain is not available, the mature wether, though making a smaller proportionate increase, will fatten more readily than the lamb on clover or alfalfa alone. The use of from ½ to ¾ lb. of grain, along with clover or alfalfa, throughout a period of from 70 to 90 days, is necessary to produce a proper finish for shipping. . . .

"The suggestion, resulting from personal experience, is offered . . . that sheep will withstand shipping better if kept on a limited allowance during transit rather than on full feed; but that feed and rest are essential toward the close of trip. The total net profit from the car of sheep was $251.29. Even though the cost of marketing is a large item, still this is offset by cheap feeders and an abundance of cheap food of good quality, which renders the feeding business a profitable industry."

The results of a swine feeding experiment, W. J. Kennedy and F. R. Marshall (*Iowa Sta. Bul. 65, pp. 209–222, figs. 5*).—This test was undertaken to learn the value of beef meal, tankage, and Standard Stock Food when fed to pigs in addition to corn meal. These animal feeding stuffs, which are slaughterhouse by-products, have been recommended on account of their high protein and ash content. The authors report analyses of the feeding stuffs used, and discuss briefly the method of manufacturing tankage and beef meal. Briefly stated these products consist of meat scraps, fat trimmings, and scrap bones cooked by steam under pressure. After the fat is removed the resulting product is dried, pressed, and ground.

Five lots of 6 cross-bred pigs each were used in the test. Lot 1 was fed corn meal only, consuming when on full feed 10 lbs. per head daily. Lots 2, 3, and 4 were fed, respectively, Darling's Beef Meal, Swift's Digester Tankage, and Armour's Tankage in addition to corn meal, consuming when on full feed 1.67 lbs. of the special feed and 8.67 lbs. of corn meal per head daily. Lot 5 was fed Standard Stock Food in addition to corn meal, consuming when on full feed 0.333 lb. of the former and 10 lbs. of the latter per head daily. At the close of the test the pigs were sold in Chicago for $7.55 per 100 lbs. The following table shows the principal results obtained:

Average results of feeding various animal feeds to pigs in addition to corn.

Feeding stuffs.	Average weight at the beginning.	Average daily gain per pig.	Cost of feed per pound of gain.	Shrinkage in shipping.	Net profit per pig.	Returns for 1 bu. of corn.
	Pounds.	*Pounds.*	*Cents.*	*Pounds.*		*Cents.*
Lot 1, corn	197	2.08	5.1	10.67	$2.39	83.0
Lot 2, corn and Darling's Beef Meal	197	2.40	4.8	13.33	2.93	93.0
Lot 3, corn and Swift's Digester Tankage	202	2.57	4.5	13.83	3.22	97.5
Lot 4, corn and Armour's Tankage	198	2.27	4.9	13.67	2.57	88.0
Lot 5, corn and Standard Stock Food	197	2.23	5.0	10.50	2.64	84.0

According to the authors, in the fattening of young pigs, a ration containing more protein and ash than a corn ration gave better results than a ration of corn only. Attention is called to the fact that this conclusion is based upon but one test and may be modified by future experiments.

Pork production experiments and hog ranching, R. L. BENNETT (*Arkansas Sta. Bul. 73, pp. 45–57*).—A reprint from publications previously noted (E. S. R., 8, p. 816; 10, p. 1085).

Experiments with sugar as a feeding stuff, ALEKAN (*Ann. Sci. Agron., 1901, II, No. 1, pp. 38–48*).—In a paper presented at the International Congress of Agricultural Experiment Stations, June, 1900, the author briefly reports the results of experiments in which sugar formed part of the ration of horses. Rations containing sugar were regarded as especially satisfactory.

The history of horseshoeing, E. AUREGGIO (*Ann. Soc. Agr. Sci. et Ind. Lyon, 7. ser., 8 (1900), pp. 65–97, figs. 34*).—A discussion based on the exhibit at the Paris Exposition in 1900.

Cooperative experiments on the cost of egg production, H. H. WING (*New York Cornell Sta. Bul. 204, pp. 23–67*).—The station cooperated with a number of practical poultry feeders to secure information regarding the winter production of eggs and the number of eggs produced per fowl under different systems of feeding, care, and management. The flocks included ranged from 25 to 600 fowls, exclusive of males. A summary of the tests follows:

In the 17 weeks from December 1 to March 29 in 12 flocks, representing 8 owners and 2,100 fowls, the average daily production of eggs was 23.2 per 100 fowls. During the same time the average food cost of 1 doz. eggs was 16.3 cts. The flocks that laid most eggs during December and January laid most eggs also in March.

The egg production of pullets (hatched in 1901) was notably in excess of that of hens, particularly in the earlier periods, when the price of eggs was highest. The average cost of feeding 100 hens for the 17 weeks was $32.43. The average excess of production over cost of food for 17 weeks was $23.93 per 100 fowls.

Two hundred eggs a year per hen; how to get them, E. L. Warren (*Wolfeboro, N. H.; Author, 1902, pp. 80, figs. 7*).—A general discussion of egg production and poultry raising for profit.

The iron content of hens' eggs, C. Hartung (*Ztschr. Biol., 43 (1902), No. 2, pp. 195–212*).—Feeding experiments reported in detail led to the conclusion that it was not possible to materially increase the iron content of eggs by supplying a diet rich in iron.

The production of oxygen in hens' eggs, K. A. Hasselbalch (*Skand. Arch. Physiol., 13 (1902), No. 1–2, pp. 170–192*).—Respiration experiments with fertile and infertile eggs are reported.

DAIRY FARMING—DAIRYING.

Some feeding experiments with cows, H. J. Patterson (*Maryland Sta. Bul. 84, pp. 121–154*).—Four series of experiments conducted at the station from 1896 to 1901 are reported in detail, and a paper upon the production of protein feeds upon the farm, including a number of rations for dairy cows, is appended.

Comparison of an exclusive corn meal ration with a balanced ration of mixed grains (pp. 121–126).—Corn meal and a mixture of corn meal, wheat bran, and gluten meal (5:3:2) fed in equal quantities were compared with 6 cows. For the most part the rations were fed alternately by lactation periods. The results in all cases were considered in favor of the mixed grain ration, not only as regards production and profit, but in some instances as regards the health of the cow.

Mixed grain rations of different degrees of richness in protein (pp. 126–135).—Fourteen cows which had received uniform treatment for some time were divided into 2 equal lots and fed experimentally for about one year, during which time the nutritive ratio for one lot was gradually increased to 1:7.9 and that for the other lot was decreased to 1:5.2. The results, which are given in full in tabular form, seem to indicate that under Maryland conditions a ration having a nutritive ratio between 1:6.9 and 1:7.9 is the most economical for milk production. The subject is to be investigated further in connection with the study of the different sources of protein.

The new corn product as roughage for cows (pp. 136–142).—Six cows were fed soiling corn for 2 weeks and the new corn product for the 2 weeks following. During the second period the total yield of milk was increased 28 lbs. and the yield of butter 17.2 lbs., the amount of grain consumed, however, being 29 lbs. greater. The new corn product was also compared with mixed hay and shredded corn fodder in an experiment lasting 4 months in which 6 cows remained for the whole period. The new corn product was fed during the first and third months of the experiment, hay during the second month, and corn fodder during the fourth month, the results showing a maximum yield of butter with a minimum consumption of grain feed when the new corn product was used. The yield of milk, however, was not so large as on mixed hay.

Test of sugar feed ration (pp. 142–146).—A test was made of a proprietary feeding stuff reported as made up of ground fodder, grain, and beet molasses, and showing the following composition: Water 11.80, protein 16.97, fat 1.87, nitrogen-free extract 51.25, crude fiber 12.34, and ash 5.77 per cent. Seven cows were used in the test, 4 being fed exclusively on the sugar feed for 16 days, and 3 on a grain and grass ration. The rations were then reversed and the feeding continued for a second period. The sugar feed was not eaten very readily by some of the cows. Those that did, however, showed an increase in the yield of milk in changing to this ration and a decrease when it was discontinued, indicating, according to the author, that this feed has considerable value as a food for cows and is capable of serving as a complete ration.

Experiments on the feeding of dairy cows, L. Grandeau (*Jour. Agr. Prat., n.*

ser., 7 (1902), No. 45, pp. 633–635).—Experiments conducted by L. Nicolas are reported and discussed. Two rations were compared with 2 lots of 10 cows each, the experiment lasting 2 months. Ration 1 was composed of beets, oil cakes, bran, hay, and oat straw; contained 1.030 kg. of protein, 6.222 of carbohydrates, and 0.361 of fat; and had a nutritive ratio of 1:8.57. Ration 2 was composed of molasses, bran and middlings, beets, chaff, and oat straw; contained 0.592 kg. of protein, 5.139 of carbohydrates, and 0.158 of fat; and had a nutritive ratio of 1:11.89. A record was kept of the live weight of the cows, the yield of milk, and the fat content of the milk during every tenth day of the experiment. The results showed a diminution in live weight and in milk production on the molasses ration as compared with the ordinary ration. The author, however, attributes the results not to the molasses, but to its substitution in too small quantities for concentrated feeds.

Feeding beet pulp and sugar beets to cows, B. C. Buffum and C. J. Griffith (*Colorado Sta. Bul. 73, pp. 11–24*).—A ration containing 24 lbs. of beet pulp was compared with one containing 12 lbs. of sugar beets. The rations in other respects were alike and had the same nutritive ratio. The experiment included 4 cows for 11 weeks, 1 cow for 4 weeks, and 5 cows for 3 weeks. Detailed data are presented in tables, and notes are given on the different cows. The results for the 5 cows longest in the experiment showed an average weekly gain in live weight of 6.2 lbs. and an average weekly yield of 131.1 lbs. of milk and 6.76 lbs. of butter when fed pulp, and an average weekly gain in live weight of 0.2 lb. and an average weekly yield of 127.4 lbs. of milk and 6.90 lbs. of butter when fed beets. The profit from feeding pulp at $1 per ton was over 3 times as much as the profit from feeding beets at $4 per ton. With butter at 20 cts. per pound the feeding value of pulp is estimated at $2.61 per ton and that of beets at $5.06 per ton.

Demonstration experiments on the feeding of dairy cows conducted at the expense and under the supervision of the government during the winter of 1901–2 (*Bul. Agr. [Brussels], 18 (1902), No 6, pp. 880–972*).—Detailed data are given for a large number of feeding experiments carried out in the different provinces of Belgium, with a view to improving the rations in ordinary use. In each instance the ordinary and modified rations and the yield of milk and butter and other data are given, together with comments and conclusions.

Influence of kola feeding stuff upon milch cows, O. Hagemann, J. Huth, and E. H. Stein (*Landw. Jahrb., 31 (1902), No. 4, pp. 519–527*).—The influence of this feeding stuff upon milk secretion was tested with one cow during 2 periods of 1 month each and the digestibility of the material was determined. A slightly favorable action upon milk secretion was considered as shown by the results.

Milking sheds, R. Crowe (*Jour. Dept. Agr. Victoria, 1 (1902), No. 6, pp. 574, 575, pls. 5*).—An illustrated description of the type of milking sheds extensively used in Victoria.

Investigations on the micro-organisms in the air of stables, in freshly drawn milk, and in the mammary gland, C. Barthel (*Rev. Gén. Lait, 1 (1902), Nos. 22, pp. 505–516; 23, pp. 529–542*).—The investigations here reported were made at different times from 1899 to 1902, and included determinations of the number of micro-organisms and studies of the different kinds. Cultures made from the udders of 14 cows showed the presence of micro-organisms in every instance. As, however, control cultures from other tissues gave similar results and as the experiments were not carried on under entirely favorable aseptic conditions, the author was unable to decide whether or not micro-organisms are normally present in the healthy udder. The work was directed mainly toward determining the species present. The general conclusion is drawn that the micro-organisms found in the air of stables, in freshly drawn milk, and in the udder of the cow are only the species commonly found in the air and have in general no action on milk, and that they are therefore very probably without practical interest in dairying.

A new micrococcus isolated from straw, causing ropy milk, J. Hohl (*Rev. Gén. Lait, 1 (1902), No. 22, pp. 516–522*).—The author reports a study of the biology of a micrococcus to which the name *Karphococcus pituitoparus* is given. The organism was isolated from the interior of a bale of straw from France, and was capable of causing ropiness in both sterilized and unsterilized milk.

Creaming of milk during its sale, W. Frear and M. H. Pingree (*Jour. Amer. Chem. Soc., 24 (1902), No. 11, pp. 1136–1138*).—A deep can containing 2 gal. of milk was set in cold water and pint samples of milk were taken by means of a dipper at irregular intervals during a period of about 8 hours and examined for fat content and specific gravity. Seven samples were thus examined. "The results show very clearly that customers buying the second to sixth portions of milk, inclusive, would receive much more than their share of the fat, and the last comers a greatly impoverished milk, when the conditions of sale resemble those of this experiment."

The ripening of cream, M. Henseval (*Rev. Gén. Lait, 2 (1902), No. 1, pp. 1–8*).—Methods are described, pratical suggestions are given, and the advantages of pasteurizing cream and ripening with pure cultures are pointed out.

Chemical analyses and physical constants of milk, M. G. Quesneville (*Abs. in Rev. Gén. Lait, 2 (1902), No. 2, pp. 34–37*).

The specific gravity and water content of milk serum, J. Nisius (*Milch Ztg., 31 (1902), No. 27, pp. 417–419*).—Formulas are given for these calculations.

Action of lactic acid solutions upon copper, with especial reference to the manufacture of sour-milk cheese, M. Siegfeld (*Milch Ztg., 31 (1902), No. 26, pp. 401–403*).—Determinations were made of the copper and tin dissolved by a 1 per cent solution of lactic acid and by whey having practically the same acidity. In 24 hours the whey, at 35 to 40° C., dissolved 2.7 mg. from a copper plate having a surface of about 100 square centimeters. The author discusses the poisonous properties of copper, and concludes from the results of his experiments that there need be no fear of poisoning from the use of copper kettles in the manufacture of sour-milk cheese.

Concerning the heating of milk with special reference to dairies, A. Tjaden, F. Koske, and M. Hertel (*Arb. K. Gesundheitsamte, 18 (1901), No. 2, pp. 219–354, pls. 3, figs. 19*).—Extended laboratory experiments are here reported, and a bibliography is appended. It was found that the momentary heating of milk to 98° C. was not always sufficient to kill the tubercle bacillus. The quality of the milk, however, was considered as having considerable influence in the experiments. With the new forms of apparatus for heating milk, and under dairy conditions, it is considered that continuous heating to 90° is sufficient to render disease-producing germs harmless, and that with a rapid heating of the milk to that temperature under thorough agitation, followed by prompt cooling to a low temperature, the chemical and physical properties of the milk undergo practically no change.

Bitter milk and cheese, F. C. Harrison (*Rev. Gén. Lait, 1 (1902), Nos. 20, pp. 457–469; 21, pp. 485–499*).—During the latter part of 1901 the author investigated the cause of a bitter flavor in milk and cheese, the trouble being met with in cheese factories in Ontario. A yeast was isolated from samples of bitter curd which was capable of producing a bitter flavor when added to sterile milk. From milk inoculated with this yeast bitter cheese was made in a number of experiments. The yeast, to which the name *Torula amara* is given, was found in the milk from nearly every farm supplying one of the cheese factories. A study of the biology of the yeast is reported in detail, and the literature relating to the subject is reviewed, a bibliography being appended. The yeast was not found in milk drawn into sterile dishes nor in the air of the stables but was found regularly in mixed milk, cheese, whey, and can washings. It was also found on the leaves of certain species of maple. The yeast was not destroyed in cans by washing with water at about 200°F., according to the usual farm practice. It grew well in whey in the presence of 1 per cent of acid, and acted energetically on lactose. Butter made from cream which had been sterilized or pasteurized and inoculated with the yeast was very inferior in quality, having, in the case of pasteurized cream, a pronounced bitter, disagreeable taste. The results of a bacteriological examination of the air of the stables, the first milk, the mixed milk, and the washings of milk cans at 96 dairies are presented in tabular form.

Curing of Cheddar cheese with especial reference to cold curing, S. M. Babcock and H. L. Russell (*Wisconsin Sta. Bul. 94, pp. 44, figs. 10*).—Changes occurring in cheese during ripening and theories regarding the cause of these changes are briefly stated; various methods of curing which have been employed in this country are described, special attention being given to methods involving the control of temperature, such as the use of subearth ducts; 5 series of experiments in curing cheese at low temperatures are reported; and the advisability of cooperative curing rooms is discussed.

An account of the greater part of the experimental work reported in this bulletin was given in the last report of the station (E. S. R., 13, p. 988). Additional data, however, are given on series 3 and 4 of the experiments not previously completed, and a fifth series, in which cheeses were made with 6 and 9 oz. of rennet per 1,000 lbs. of milk and cured at temperatures of 33, 40, and 60° F., is reported. The results of the experiments are discussed at greater length than in the previous article, the advantages and disadvantages of cold curing being considered from a commercial standpoint.

The authors consider that the cheese cured at temperatures of from 33 to 50° was superior in flavor, commercial value, keeping qualities, and in other respects, to the cheese cured at 60°, and that the losses due to mold and shrinkage were much less.

"While the cold-cured cheese is exceptionally mild in flavor, even when a year or more old, it is possible to subsequently develop almost any degree of flavor desired by exposing the cheese to higher temperatures (60° F.) for varying periods of time after they have been thoroughly broken down under cold curing conditions. The danger of developing abnormal or undesirable flavors is much less in this subsequent treatment than it is where the green cheese is held for a period at high temperatures.

"In cold-cured cheese it is permissible to use much larger amounts of rennet than can be safely used in cheese cured at 60° F. or above. This increase in rennet hastens the course of the ripening and has a tendency to make the cheese more open in body, but even with two or three times the normal amount of rennet the flavor of cold-cured cheese is still clean and mild and the texture smooth and silky. . . .

"[Cold curing of cheese] can not well be applied to the handling of the product of a single factory as it entails the use of refrigeration (natural or mechanical) to secure the desired temperatures. If, however, cooperate effort is secured between a number of contiguous factories, or a system of factories under syndicate control, the cost of constructing a properly insulated and equipped cold-curing station will be no more than must be expended in building proper curing rooms in a dozen to twenty factories. Where a consolidated curing station is erected, the making factories may be of simplest construction and do not need any provision for curing the cheese, as the product should be shipped every few days to the central curing station. There are numerous other evident advantages that will accrue from this method of handling cheese, all of which will tend to lower the cost of the product, such as the lessened expenses of buying, of transportation, etc., while at the same time the product is of better quality, more uniform, and of much better keeping quality."

VETERINARY SCIENCE AND PRACTICE.

The practice of veterinary surgery. I, Operative technique, J. A. W. Dollar (*New York: Wm. R. Jenkins, 1902, pp. 269, figs. 272*).—The present volume is the first of a series of 3 intended to cover the whole field of veterinary surgery. The subjects treated in this volume are those which relate to operative technique, and special mention may be made of the following: General discussion of operations; means of throwing and securing animals for operations; anaesthesia; antisepsis; division of tissues; the use of setons; cauterization; methods of uniting wounds; scarification; transfusion; methods of preventing hemorrhage; injection of medicine into the blood, subcutaneous tissue, trachea, œsophagus, larynx, and parenchyma of organs; bandaging and dressing; massage and castration. The volume is based on the author's personal experience and on modern operative technique, especially as developed by the leading German and Italian veterinarians.

Operative veterinary surgery, G. Fleming (*New York: Wm. R. Jenkins, 1902, Vol. II, pp. XXVII + 431, figs. 345*).—In this part of the author's work on operative veterinary surgery especial attention is given to a discussion of methods of securing animals for operation, the employment of anaesthetics, elementary operative veterinary surgery, general operations, operations on the digestive apparatus, abdominal, respiratory apparatus, thoracic cavity, larynx, trachea, urinary apparatus, generative apparatus, eye, ear, and foot.

Animal castration, A. Liautard (*New York: Wm. R. Jenkins, 1902, 9. ed., pp. 165, figs. 45*).—In this edition of the author's handbook on castration of domesticated animals the results of recent veterinary practice and experimentation along these lines has been thoroughly incorporated. The volume, as before, contains a detailed discussion of the castration of Cryptochids by the various methods which have been devised, methods of castrating the various species of domesticated mammals and birds of both sexes, and the complications which may follow upon these operations.

American horse, cattle, and sheep doctor, R. McClure (*Chicago and New York: The Henneberry Co., 1901, pp. 413, figs. 43*).—This volume contains a brief discussion of the diseases of horses, cattle, and sheep. The diseases are arranged alphabetically under the head of these different animals. The various medicines which are in use in veterinary practice are also arranged in an alphabetical manner, and brief notes are given on the properties and use of these methods. A number of formulas are given for preparing remedies for specific purposes, and a brief statement is presented of the comparative doses of medicine for different animals.

The veterinary compendium, W. E. Van Ame (*Ft. Wayne, Ind.: The Live Stock Proprietary Remedy Co., 1902, pp. 160*).—Brief popular descriptions of the common diseases of the various domesticated animals.

A manual of bacteriology, clinical and applied, R. T. Hewlett (*Philadelphia: P. Blackiston's Son & Co., 1902, 2. ed., pp. 523, pls. 20, figs. 64*).—In this new edition of the office work on bacteriology, several sections have been rewritten and an attempt has been made to bring the whole subject matter up to date as nearly as possible. Special attention is given to a discussion of those portions of bacteriology which are of particular interest in medicine and hygiene. As a rule, diseases which are strictly confined to the lower animals are not discussed. The following subjects may be mentioned among those which are treated in the volume: Nature, structure, and functions of bacteria; methods of cultivating bacteria; preparation of tissues; methods of studying bacterial diseases; antisera and antitoxins; anthrax; acid-fast bacteria, including the organisms of tuberculosis, glanders, etc.; tetanus; malignant edema; blackleg; pathogenic protozoa; antiseptics and disinfectants; and various other diseases which are confined to man.

Cellular toxins or the chemical factors in the causation of disease, V. C. VAUGHAN and F. G. NOVY (*Philadelphia and New York: Lea Brothers & Co., 1902, 4. ed., pp. 495, pl. 1, figs. 2*).—The present volume in its enlarged and revised form contains an elaborate review of the factors which are concerned in the production of diseases and a critical discussion of the experimental work which has led to the formulation of modern theories of disease. Special mention may be made of the following subjects which are treated in the volume: A general account of the etiology of bacterial diseases; the classification and definition of chemical products of bacteria, including ptomaines, bacterial proteids, bacterial cellular proteids, and toxins; a historical sketch of bacterial poisons; detailed discussions of the bacterial poisons of various infectious diseases, including anthrax, Asiatic cholera, tetanus, diphtheria, tuberculosis, hog cholera, rabbit septicemia, malignant edema, glanders, etc.; germicidal properties of blood serum, including alexins and nucleins, specific precipitins, lysins, and agglutinins; the theories of immunity; and the chemistry and physiological action of ptomaines and leucomaines.

Protargol in veterinary surgery, W. E. A. WYMAN (*Jour. Comp. Med. and Vet. Arch., 23 (1902), No. 5, pp. 269–273*).—This remedy has been extensively used by the author with good results in the treatment of a number of diseases, including glossitis, osteomyelitis, poll evil, fistula, mastitis, and wounds.

Lysol in agriculture (*El lisol en agricultura. Barcelona: Mora & Co. [1900], pp. 64, figs. 39*).—In this pamphlet a general account is given of the methods of applying lysol as an antiseptic remedy in the treatment of animal diseases, and in the treatment of various insect pests of field crops, fruits, and garden vegetables.

Intravenous injections of corrosive sublimate in the treatment of infectious diseases, A. DEGIVE (*Ann. Méd. Vét., 51 (1902), No. 1, pp. 25–33, figs. 4*).—A brief review is given of the literature relating to experiments in making intravenous injections of corrosive sublimate in the treatment of foot-and-mouth disease, swine erysipelas, contagious coryza, glanders, septicemia, anthrax, erysipelas, and syphilis. The author believes that experiments thus far conducted with this substance indicate that it exercises an active therapeutic effect in infection by a number of contagious diseases.

The disinfection of stalls and railroad stock cars by means of glycoformal with Lingner's disinfection apparatus, RÖDER (*Berlin. Thierärztl. Wchnschr., 1901, Nos. 51, pp. 777–781; 52, pp. 789–794, figs. 3*).—A critical discussion of the literature on this subject is given in connection with a bibliography. Lingner's disinfection apparatus consists of a circular copper kettle containing 1½ liters of hot water, the water being maintained at the boiling point by an alcohol flame underneath. In an iron receptacle, which is placed inside of the ring-shaped kettle containing the hot water, 2 kg. of glycoformal is poured. The fumes of this substance are driven off by means of heat. The author's experiments were made on the bacilli of anthrax and glanders and on the virus of the foot-and-mouth disease, as well as on fowl cholera. As a result of the author's extensive experiments it is concluded that disinfection of stalls and railroad cars by means of glycoformal with the use of Lingner's apparatus is exceedingly effective, easily practiced, safe, and not expensive. The stalls and cars need not be out of use more than 5 or 6 hours, since in this length of time the pathogenic organisms are certainly destroyed, and the stalls or cars may be readily prepared for receiving animals after being ventilated.

State and Territorial laws relating to contagious and infectious diseases of animals, 1901 (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 43, p. 72*).—This bulletin contains copies of the various State and Territorial laws relating to infectious diseases of animals which were enacted during the year 1901. The various laws are arranged alphabetically under the names of the respective States and Territories.

Report on the veterinary service in the Kingdom of Saxony for the year 1901 (*Ber. Veterinärw. Königr. Sachsen, 46* (*1901*), *p. 253*).—This annual report contains an account of the personnel of the veterinary commission of Saxony, together with short reports from a large number of district veterinarians, notes on inspection of animals before and after slaughter, and governmental insurance of food animals. A description is also given of the curriculum and work done at the Veterinary High School of Saxony. The reports of the various district veterinarians are summarized by Siedamgrotzky. Indemnities were paid for losses from glanders, anthrax, blackleg, foot-and-mouth disease, and cerebro-spinal meningitis. Special notes are given on the prevalence of anthrax, blackleg, rabies, glanders, foot-and-mouth disease, pneumonia, mange of horses, sheep scab, swine erysipelas, swine plague, fowl cholera, and tuberculosis. Many of the cases of these various diseases presented peculiar symptoms of post-mortem conditions, and these peculiarities are especially mentioned in the report. Notes are also given on the use of potassium iodid in treating milk fever, silver preparations in treating petechial fever of horses, and various other drugs in the treatment of different diseases.

Annual reports of proceedings under the diseases of animals acts, the markets and fairs (weighing of cattle) acts, etc., for the year 1901, A. C. COPE and J. T. TENNANT (*London: Bd. Agr., 1902, pp. 82, pls. 4*).—An extensive outbreak of hog cholera occurred in different parts of England during the year 1901. The number of cases definitely identified by the Board of Agriculture was 3,140. Many theories were held by different stock owners as to the etiology of this outbreak. It was suspected that foreign feeding stuffs or the swill from hotels had produced the disease in certain instances. These hypotheses, however, were shown to be unfounded. The hog cholera was thought by some to be the same as typhoid fever in man, but inoculation experiments showed definitely that such was not the case. An extensive outbreak of foot-and-mouth disease occurred in 1900, but was finally eradicated in April, 1901. The most stringent measures were taken, including the slaughter and destruction of all affected animals and strict isolation of animals which had been exposed. It is believed, therefore, that this disease can be controlled by vigorous sanitary measures.

It is stated that the general condition of horses imported from the United States and elsewhere during the year was very good. Cases of glanders and other dangerous infectious diseases among imported horses were exceedingly rare. Glanders is on the increase among horses in England. The number of infected stables is increasing with considerable rapidity and the authors believe that the law relating to glanders will require some alteration before it will be possible to check or eradicate this disease.

Rabies, although practically exterminated in England, is occasionally detected. Large numbers of supposed cases are reported to the Board of Agriculture, but nearly all of them prove to be cases of some other disease. One case of rabies was discovered in a cow, and it appears from this fact that rabies must exist in one or more dogs in the locality where the cow was found. Details are given on the treatment and sanitary measures adopted in outbreaks of foot-and-mouth disease, hog cholera, rabies, anthrax, and sheep scab. The prevalence of sheep scab is gradually becoming less and the area of distribution is being restricted.

Human and bovine tuberculosis, R. KOCH and J. W. SCHÜTZ (*Arch. Wiss. u. Prakt. Thierh., 28* (*1902*), *No. 1–2, pp. 167–196*).—This article is a report made by the authors to the Minister for Agriculture, Public Domains, and Forests on July 1, 1901. A detailed account is given of numerous experiments conducted for the purpose of comparing the virulence of human and bovine tubercle bacilli for calves, sheep, and pigs. The introduction of the tubercle bacilli into the experimental animals was effected in 5 ways—by feeding, subcutaneous injection, intra-abdominal injection, intravenous injection, and by inhalation. The results of the experiments on calves showed that cattle were not susceptible to the bacillus of human tuberculosis, while the bacillus of bovine tuberculosis possessed a very great virulence for these animals. It is recommended that for a quick determination of the origin of tubercle bacilli a hypodermic injection be made in calves. After such injection infection takes place rapidly if the tubercle bacilli are of bovine origin, while such infection does not occur if bacilli of human origin are used. The results obtained from experiments on sheep and hogs were similar. Experiments in feeding and subcutaneous, intraperitoneal, and intravenous injections of tubercle bacilli of human origin showed that the hog is not susceptible to these organisms, while the bacilli of bovine origin were exceedingly virulent for hogs. Similar results were obtained on sheep. The tubercle bacilli of human origin in many instances retained their virulence for a long time at the point of inoculation, but did not show a tendency to distribute themselves from this point and produce a general infection in the inoculated animal.

The comparative virulence for animals of tubercle bacilli of bovine and human origin, A. De Jong (*Ann. Med. Vet., 51 (1902), Nos. 4, pp. 181–190; 5, pp. 251–259*).—The experiments, the results of which are published in this paper, are said to have been made previous to Koch's address at the British Congress. In general the results obtained by the author are contradictory to those of Koch. In making inoculations with tubercle bacilli, the intravenous method was usually chosen, since that is considered the most rapid and certain method of producing an infection. The author's conclusions may be stated as follows: The tubercle bacilli of human origin are capable of producing tuberculosis in cattle and also in other domesticated animals, such as sheep, goats, dogs, etc. Tuberculous infection produced in animals by tubercle bacilli of human origin is usually less serious than that produced by bacilli of bovine origin. It is admitted, therefore, that the bacilli of bovine origin are more virulent than those of human origin. The author believes that man must be considered as a factor of as much importance in the tuberculous infection of cattle as are cattle in infection of man by tuberculosis. It is urged, therefore, that the tuberculosis of cattle deserves more attention from the standpoint of human sanitation than has previously been accorded it.

A discussion of the relation between human and bovine tuberculosis, with special reference to primary infection in children through the alimentary tract, A. D. Blackader (*Boston Med. and Surg. Jour., 145 (1901), pp. 665–671*).—A review is given of the work on tuberculosis which laid the foundation for the general belief that the milk and meat of tuberculous animals are dangerous to man. The author presents evidence for the belief that a species of bacterial organism like the tubercle bacillus may gradually undergo changes in morphology and virulence by a continued sojourn in the body of a different species from that in which it originated. He states that "much clinical and bacteriological work still remains to be accomplished before the latest statement of Koch can be either accepted or contradicted."

Preliminary communication of experiments upon the feeding and inoculating of calves with human tuberculous material, W. H. Park (*Proc. New York Path. Soc., n. ser., 1 (1901), No. 5–6, p. 11*).—Four calves weighing 150 lbs. were tested with tuberculin and found to be free from tuberculosis. The calves were then fed tuberculous sputum and the same material was used for inoculating the calves by hypodermic injections. The calves were again tested after 2½ months and 3 of the 4 gave a reaction. An autopsy on one of the calves showed a slight enlargement of some of the lymph nodes but no tubercle bacilli were present. The tuberculin reaction is explained by the author as due to the presence of living and dead tubercle bacilli at the point of inoculation. The 3 other calves are reported as in good health and gaining in weight.

Further experiments regarding the immunization of cattle against tuberculosis, J. McFadyean (*Jour. Comp. Path. and Ther., 15 (1902), No. 1, pp. 60–71, fig. 1*).—The present paper contains a report of experiments conducted by the author, during which an attempt was made to demonstrate the effect of repeated injections of tubercle bacilli in calves, with special reference to the possibility of an immunizing effect of such injections. Each of the 4 calves received from 7 to 11 inoculations of virulent tubercle bacilli at intervals of different length. Calf No. 1 received 1½ cc., 2 cc., 2 cc., 5 cc., 5 cc., on January 11, April 1, November 28, January 30, and May 18, respectively. A sixth inoculation with 5 cc. was given on July 31, and a seventh, with 10 cc., on October 24. The size of the doses and the length of time between the doses were approximately the same in all the calves. The cultures which were used in making the inoculations were constantly tested by inoculations of guinea pigs. The calves were inoculated intravenously in all the experiments.

All 4 calves ultimately died of tuberculosis. They resisted the fatal outcome of the disease, however, for an unusually long time, and the author ascribes this strong resistance to partial immunity produced by repeated inoculations. Almost without exception cattle succumb very rapidly to intravenous injections of virulent tubercle bacilli. The bacilli used in these experiments were not of human origin, but were obtained from a natural case of tuberculosis in a dog, and also by passage through a rabbit of cultures obtained from a case in a sheep. Upon making post-mortem examinations of the 4 cases the absence of lesions in the spleen and liver and the constancy of lesions in the kidneys were observed. During the period covered by the experiments the animals were frequently tested with tuberculin, and reacted in an irregular and uncertain manner. At times a good reaction was obtained, while at other times no reaction whatever or only a slight local reaction without rise of temperature developed. As a rule, during these tuberculin tests the maximum temperature was reached between 6 and 9 hours after injection.

Wheezing as a result of retropharyngeal tuberculous adenitis in cattle, C. Besnoit (*Rev. Vet.* [*Toulouse*], *27 (1902), No. 6, pp. 365–377, fig. 1*).—Notes are given on the symptoms and development of this peculiar affection, and a special report is made on a case in a cow which was finally subjected to emergency slaughter. During life the animal had exhibited symptoms of difficult respiration and at times had been apparently in danger of strangulation. The post-mortem examination revealed a generalized tuberculosis, with the development of a large tumor in the retropharyngeal glands. This tumor pressed upon the larynx so as to cause difficulty in breathing.

A proposal of a new plan for controlling tuberculosis of cattle conservatively, "Columella" (*Jour. Comp. Med. and Vet. Arch., 23 (1902), No. 1, pp. 16–21*).—In view of the great expense which would be incurred by the State in paying an indemnity for all tuberculous animals, a plan is suggested in this article whereby all possible service may be secured from tuberculous cattle and no unnecessary loss suffered. It is suggested that certain persons be licensed to purchase tuberculous cows, that these licenses be granted subject to a board appointed for the purpose, and be free, but under certain restrictions exercised by the board. It is recommended that all tuberculous animals bought or sold by such licensed persons be branded or marked in some other way easily recognizable. The milk is to be pasteurized and sold as milk or made into butter. Calves are to be removed from the cows after 3 days and the cows especially inspected from time to time, and when unfit for milk production may be brought to a market condition, if possible, and sold for meat, under certain restrictions. It is suggested that this plan might encourage farmers to eliminate tuberculous cattle from their herds.

The X-ray as an aid to diagnosis of tuberculosis in cattle, J. V. Laddey (*Jour. Comp. Med. and Vet. Arch., 23 (1902), No. 2, pp. 97–104, figs. 4*).—The author tested the value of X-rays in the diagnosis of bovine tuberculosis in all its stages. A number of radiographs were taken, some of which are reproduced in the text. It appears from the author's observations that the presence of even small tubercles in the lungs may be detected by the use of X-rays. The tubercles may be discovered in this way with considerable certainty as soon as calcification takes place. In advanced cases of tuberculosis, in which the clinical symptoms of the disease are not pronounced and in which tuberculin fails to give a reaction, the use of X-rays furnishes a valuable means for detecting the tuberculous foci in the lungs or other organs.

Culture and biology of the tubercle bacillus, H. Menzi (*Ztschr. Hyg. u. Infectionskrank., 39 (1902), No. 3, pp. 407–427*).—The author undertook experiments to test the validity of results obtained by Dr. W. Hesse in cultivating tubercle bacillus upon an agar medium to which Heyden's nutrient material was added. As a result of numerous experiments it was found that the Hesse agar is a good nutrient medium for pure cultures of tubercle bacilli, being about equal to the blood of cattle. In the author's experiments the virulence of the tubercle bacillus was retained for several months upon a Hesse agar without exhibiting any pronounced increase or attenuation. With the use of this nutrient medium it was found possible to observe an increase in the tubercle bacilli in the sputum in a few days. If, however, the number of bacilli in the sputum was very small, it proved a difficult matter to follow their development upon the Hesse agar and this nutrient medium was found to possess no advantage over direct microscopic investigations for this purpose. The organisms which are associated with tubercle bacilli are somewhat checked in their development by the Hesse agar, but not sufficiently to allow small colonies of tubercle bacilli to be readily distinguished. The author argues, therefore, that we have no generally applicable method for isolating tubercle bacilli except that of inoculation of experimental animals.

Studies on the action of urea and ammonium carbonate on cultures of tubercle bacillus in bouillon, Rappin (*Compt. Rend. Soc. Biol. Paris, 54 (1902), No. 10, pp. 318–320*).—In this paper the results previously obtained by the author are confirmed. It was found that urea in the proportion of 0.003 or 0.005 gm. to 1 gm. per 100 gm. of bouillon exercised a restraining influence upon the development of the tubercle bacillus. This effect of the urea was destroyed by the addition of glucose in the proportion of 5 parts in 100 of bouillon. Similar results were obtained by the use of ammonium carbonate, the latter substance checking the development of tubercle bacillus, even more than did urea. An antiseptic effect was observed when used in the proportion of 0.001 gm. to 100 gm. of bouillon.

The resisting power of buffaloes against experimental tuberculosis, M. Prettner (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 14, Orig., pp. 681–686*).—A number of experiments were conducted for the purpose of testing the resisting power of these animals to tuberculosis. During these experiments it was found that buffaloes were remarkably refractory to inoculation with tuberculosis material in general, and that they showed complete immunity against inoculation with artificial cultures. Pure cultures acted as if they were attenuated when inoculated into buffaloes. It is stated that among 5,000 buffaloes slaughtered for meat which were inspected by the author, no case of tuberculosis was observed.

The effect of tubercle bacilli introduced in the trachea upon the lungs of rabbits, K. Watanabe (*Beitr. Path. Anat. u. Allg. Path., 31 (1902), No. 2, pp. 367–382, figs. 7*).—The author's experiments consisted in making intratracheal injections of tubercle bacilli in rabbits and studying, by means of microscopic preparations, the alterations which the bacilli caused in the lungs at varying periods of time. It was found that the tubercle bacilli first attacked the epithelial elements of the minute bronchi and alveoli. In these situations swelling and separation of epithelial cells are occasioned. Simultaneously a serous exudation occurs and an accumulation of polynuclear leucocytes. The first stage of infection is, therefore, a sort of catarrhal inflammation. Secondarily proliferation of the tissue may occur, accompanied with an accumulation of mononuclear leucocytes while the polynuclear leucocytes decrease in number. The giant cells were found to arise by fusion of the other cells.

Histogenesis of hematogenous tuberculosis in the liver of rabbits, J. MILLER (*Beitr. Path. Anat. u. Allg. Path., 31 (1902), No. 2, pp. 347–366, pl. 1*).—The author gives a brief critical review of the literature relating to the histogenesis of tubercles in different organs of various animals. The experiments reported in this article were made upon rabbits. Direct injections of virulent tubercle bacilli were made into the veins of the liver and the affected rabbits were killed at various lengths of time after inoculation in order to make possible a careful study of the tubercles in the liver. As a result of these experiments it was found that after a hematogenous infection the development of the tubercle in the liver of rabbits begins with an intravascular and perivascular inflammation with polynuclear leucocytes. The first alteration of the fixed tissue cells of the liver in rabbits consists in a swelling and separation of the endothelial cells of the capillaries. These endothelial cells form the epithelioid and giant cells of the tubercle. It was found that a typical tubercle might arise without any observable mitosis. Giant cells were found to arise by fusion of the separated capillary endothelial cells. In the development of the tubercle the liver cells took no active part. The fate of the tubercle bacilli in the liver was not determined by the author. He was unable, however, to observe any leucocytes containing the bacilli.

Hematological studies on experimental tuberculosis of guinea pigs, H. CLAUDE and A. ZAKY (*Compt. Rend. Soc. Biol. Paris, 54 (1902), No. 16, pp. 505–507*).—The authors conducted an extensive series of experiments on guinea pigs for the purpose of determining the relative variation in the number of different corpuscles in the blood at different stages in the development of tuberculosis and under the influence of various lines of treatment. The guinea pigs were divided into 8 lots, of which 1 lot was untreated, and the other 7 lots received various lines of treatment, including injections of lecithin, with or without the addition of creosote or sulphate of iron. The number of red and white corpuscles of various kinds in the blood at different stages of the disease are presented in tabular form.

The influence of an exclusive meat diet on inoculation of tuberculosis in chickens, K. PREISICH (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 15, Orig., pp. 749–758*).—The author conducted 2 series of experiments, one in Paris and one in Budapest. In the first series 9 chickens were used in the experiment, 5 of which were fed exclusively on raw horse meat, receiving daily 150 gm. to 200 gm.; the other chickens were fed grain. The chickens were inoculated with tuberculosis from 23 to 53 days after beginning the meat diet. One chicken which received the meat diet died at about the same time with a control chicken, while 3 meat-fed chickens remained healthy, and 3 grain-fed chickens died of miliary tuberculosis. In the second series of experiments 14 chickens were used, of which 8 were fed exclusively on horse meat and 6 were fed corn. The results of these experiments are presented in a detailed tabular form. The influence of the meat diet noticeably prolonged the life of infected chickens, but was not sufficient to overcome infection in any large percentage of cases.

The contamination of meat of healthy animals with tubercle bacilli through nondisinfected slaughter or inspection instruments, G. DECKER (*Ztschr. Fleisch u. Milchhyg., 12 (1902), No. 8, pp. 225–231*).—In these experiments the purpose of the author was to determine whether in the practice of meat inspection or during the slaughter of animals healthy meat might become infected by the instruments of the butchers or by the knives used in inspection, and also to discover suitable means of preventing this infection. The results of experiments on the first point were positive. Of 47 pieces of meat and meat products handled in the ordinary manner, it was found that 19, or 40.42 per cent had become contaminated with virulent tubercle bacilli. An examination was made of 13 meat inspectors' knives, and 10 of these, or 76.59 per cent, were contaminated with the tubercle bacillus. A similar examination was made of 9 butchers' knives, showing that 3 were infected. In experiments to determine the best method of preventing infection by these means it was found that the tubercle bacilli on the knives of meat inspectors and butchers could be readily destroyed by placing these instruments in a 2 per cent solution of soda at a boiling temperature.

Preliminary report on the use of blackleg vaccine in Virginia, E. P. NILES (*Virginia Sta. Bul. 123, pp. 31-37*).—The station has been distributing blackleg vaccine since 1898, and the reports received from stock owners indicate that the losses among cattle before the use of vaccine amounted to 11.07 per cent, while after vaccination the losses average 0.89 per cent. The disease appears to be on the increase in Virginia but it is believed that it could be checked by concerted action.

Irrigation of the organism in experimental infection of tetanus, C. TONZIG (*Pub. Ist. Univ. Padova, 2 (1902), VI, pp. 11; extr. from Riforma Med., 17 (1901), No. 109*).—The author conducted a number of experiments in the treatment of tetanus. It was found that no hope can be entertained for favorable results in the treatment of tetanus by peritoneal irrigation of the affected animal with a physiological salt solution. During these experiments it was shown that the tetanus virus does not operate in the circulation but becomes fixed in the histological elements.

Traumatic tetanus in horses, C. EGGMANN (*Schweiz. Arch. Tierh., 44 (1902), No. 1, pp. 26-29*).—Detailed notes are given on the treatment of a severe case of tetanus in a horse. During the treatment the horse received 70 cc. of antitetanus serum, 70 cc. carbolic-acid solution subcutaneously, 190 gm. chloral hydrate per rectum, and 1 gm. of morphin in 2 doses. The antitetanus serum did not check the development of the violent symptoms, nor could these be controlled by the other remedies. The horse died on the third day after the appearance of the disease.

The production of toxoids in cultures of tetanus bacilli, A. BONOME (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 15, Orig., pp. 777-781*).—An attempt was made by the author to determine by culture experiments the changes undergone by the toxin of tetanus bacillus on culture media. It was found that a rapid alteration of the toxin may take place in artificial cultures. The modified toxin is called toxoid. It was found that the filtrate from a culture of *Bacterium coli* exercised a decided influence upon tetanus bacillus and its product, when the latter was exposed to its action for a half hour at a temperature of 80° C., or for a few minutes at a temperature of 100° C. It is believed that the facts thus brought to light may be of importance in producing immunization in animals which are especially susceptible.

Intracerebral injection of antitetanin for the cure of tetanus in the horse, S. VILLAR (*Jour. Comp. Path. and Ther., 14 (1901), No. 4, pp. 371, 372*).—The author describes 2 cases of tetanus in the horse treated by means of intracerebral injections of antitetanin. The symptoms became more favorable within a few hours after the injection, and recovery took place in both cases within about 3 weeks. In 1 case 3 cc. of pure antitetanin and in the other 8 cc. were administered.

Investigations on the nature of tetanus toxin, H. HAYASHI (*Arch. Exper. Path. u. Pharmakol., 47 (1901), No. 1-2, pp. 9-18*).—As a result of the author's studies it was found that the toxin isolated from cultures of the tetanus bacillus according to the method of Brieger and Boer shows an evident protein reaction. The toxin, therefore, belongs to this group of chemical bodies. It is partly precipitated in a saturated solution of magnesium sulphate. When precipitated with absolute alcohol no alteration of the physical or toxic properties of the toxin were produced. It was found also that the tetanus bacillus would not grow on a medium which does not contain protein.

Actinobacillosis, J. LIGNIÈRES and J. SPITZ (*Actinobacillose. Buenos Ayres: Coni Bros., 1902, pp. 108, pls. 9; extr. from Rev. Soc. Méd. Argentina*).—The authors have undertaken an extensive study of the diseases included under the name actinomycosis. During these investigations it was found that a large number of cases were not due to the ordinary streptothrix of actinomycosis, but to a bacillus which produces very similar pathological lesions. The disease is therefore called actinobacillosis on account of its being due to a bacillus which produces radiate structures in affected tissues. The disease has been known in Argentina for a number of years but an especially extensive outbreak occurred during the years 1900 and 1901. Actinobacillosis occurs under a number of forms and may affect different tissues, such as the skin, subcutaneous connective tissue, lymphatic glands, salivary glands, and various parenchymatous tissues. Among the vital organs the lungs, tongue, and pharynx are most often affected. The tegumentary form of the disease occurs most frequently in the region of the pharynx, where large tumors are formed which may ultimately open and discharge a part or all of their contents. As contrasted with the ordinary form of actinomycosis due to streptothrix, this form of the disease affects the lymphatic glands very frequently. It is especially frequent in the glands about the pharynx, including the retropharyngeal and sublingual. When the tongue is affected by actinobacillosis this organ becomes altered so as to present the usual symptoms of wooden tongue. Detailed notes are given on the pathological changes produced by the disease in the pharynx, salivary glands, mammary glands, and internal organs.

Considerable evidence is presented to show that actinobacillosis is infectious and that it spreads rapidly among herds of cattle. It is almost entirely confined to cattle, but may occasionally occur in sheep and other animals. The mortality in some outbreaks of the disease was as high as 52 per cent. The morphological characters and behavior of the organism on the various nutrient media are described in detail. The organism is said to possess only a slight resisting power against physical and chemical agents. It is killed by subjection to a temperature of 100° C. for 1 minute or 52° C. for an hour and a half. It is only slightly resistant to desiccation. A toxin was readily obtained from cultures of the organism, and its injurious action was tested on experimental animals. It was found that the serum of animals which had received a culture of the bacillus or of the toxin acquired remarkable agglutinating powers toward the organism. The agglutinating power manifests itself within 3 or 4 days after subcutaneous inoculation in cattle and horses, and persists for a considerable length of time. The intensity of agglutinating power varies with different animals.

Detailed notes are given on inoculation experiments in various animals. Guinea pigs were susceptible to the bacillus, while rabbits were quite resistant and birds entirely refractory. Dogs, cats, and pigs were destroyed by hypodermic inoculation, while horses and donkeys were very resistant.

Iodid of potash was found to be almost a specific for actinobacillosis. Under prolonged treatment with this remedy the lesions disappeared and a complete recovery took place in a large percentage of cases. Where superficial tumors are found it is recommended that they be opened and that the pus be evacuated. This should be followed by the ordinary treatment. The disease is recurrent and one attack does not confer immunity.

Actinomycosis, J. BARCIA Y TRELLES (*L'Ing. Agr. Gembloux, 12* (*1902*), *No. 10*, *pp. 472–486*).—A general description and discussion of this disease is presented. giving an account of the distribution, clinical symptoms, nature, bacterial cause, morbid infection, serum diagnosis, prophylaxis, treatment, and immunity.

Observations on vertebral actinomycosis in cows, POES (*Ann. Med. Vet., 51* (*1902*), *No. 2, pp. 89–92*).—In connection with the numerous cases of tubercular meningitis observed in cattle, the author considers it of importance to report the occurrence of actinomycosis of the membranes of the spinal cord, accompanied with nervous symptoms somewhat resembling those of tubercular meningitis. Upon post-mortem examination, a tumor is found surrounded by a sort of fibrous membrane. The tumor is of a grayish or brownish color, and after being sectioned is found to contain minute yellow granular colonies of actinomyces.

The unsolved problems of milk fever, J. M. W. KITCHEN (*Jour. Comp. Med. and Vet. Arch., 23 (1902), No. 4, pp. 230–234*).—The various doubtful problems concerning the etiology of this disease are discussed by the author, in connection with detailed notes on a case in which the iodid of potash treatment was used in connection with other remedies.

An enzoötic attack of chorea among cattle, A. D. KNOWLES (*Jour. Comp. Med. and Vet. Arch., 23 (1902), No. 1, pp. 37–40*).—The author reports the occurrence of symptoms of chorea among cattle after being allowed to fatten upon a 40-acre field which was fenced in during the summer and not grazed until fall. The symptoms appeared for 2 or 3 years in succession, and at times became quite serious, but did not result fatally except in one case where the animal fell into a ditch of water in one of its fits and was thoroughly chilled. The etiology of these outbreaks is not explained. It was possibly due to eating poisonous plants.

Poisoning by feeding on Sinapis nigra, F. J. ROUB (*Jour. Comp. Med. and Vet. Arch., 23 (1902), No. 4, pp. 242–244*).—Notes are given on a case of poisoning from eating this plant during which 11 cows died and 7 others were badly affected. The cows had been allowed to eat large quantities of the mustard and were affected with a rather uniform set of symptoms, including coldness of the extremities, difficult respiration, dullness of the sensorium, and more or less difficult locomotion. Some of the cows staggered and occasionally fell. Seven of the cows were treated with sulphate of soda, in 1½-lb. doses, together with nux vomica and spirits of niter. All of them recovered from the effects of the poison.

Foot-and-mouth disease, with an account of the outbreak in Suffolk during 1901, E. J. CHENEY (*Agr. Students' Gaz., n. ser., 10 (1902), No. 5, pp. 135–140*).—Notes are given on the symptoms of this disease and its infectiousness for different species of domesticated animals. An account is also presented of a number of outbreaks which occurred in Suffolk during 1901. The probable origin of these outbreaks is discussed with a view to devising means for preventing similar outbreaks in the future.

The ineffectiveness of Baccelli's method for treating foot-and-mouth disease, M. STREBEL (*Schweiz. Arch. Tierh., 44 (1902), No. 2, pp. 72–76*).—The author gives a critical review of the literature of this subject, from which it appears that many investigators have tested the effect of intravenous injections of corrosive sublimate in treating foot-and-mouth disease, without good results.

Corrosive sublimate, the newest remedy for foot-and-mouth disease, M. STREBEL (*Schweiz. Arch. Tierh., 44 (1902), No. 1, pp. 19–26*).—The treatment of foot-and-mouth disease by intravenous injections of corrosive sublimate, as recommended by Baccelli, has not given good results in the hands of other investigators. The author conducted a number of experiments in making intravenous injections in animals affected with foot-and-mouth disease, and found that the action ascribed to corrosive sublimate by Baccelli did not take place. In 3 animals a considerable increase of temperature was produced; in 3 others the temperature was unaffected; while in another 3 the temperature was slightly lowered. No curative effect was observed. The treatment was applied from 6 to 8 days after the appearance of the disease.

Pustulous dermatitis of cattle, E. LIÉNAUX (*Ann. Méd. Vét., 51 (1902), No. 5, pp. 237–245*).—A description is given of a malignant form of dermatitis, with the formation of pustules and with fatal result in one case. In this case attempt was made to treat the pustules with antiseptic washes, but without result. The cause of death in this case does not appear very clear, without assuming septicemic infection. The evidence for such infection, however, was wanting, since all the internal organs were found to be intact.

Contagious pustular dermatitis of sheep, A. H. Berry (*Jour. Comp. Path. and Ther., 14* (*1901*), *No. 4, pp. 307–312*).—The nature, symptoms, and pathological lesions of this disease are briefly discussed. Notes are also given by way of differential diagnosis between this disease and foot-and-mouth disease. As treatment the author recommends isolation of affected sheep; a change of pasture where possible to high, well-drained land; the administration of tonics and alteratives, such as a mixture of common salt, iron, and gentian; and local treatment of the pustules with some antiseptics, such as lysol, carbolic acid, or permanganate of potash.

The lesions in sheep pox; their complete similarity from a microscopical and histological standpoint with the lesions of cow pox, variola, syphilis, and cancer, F. J. Bosc (*Compt. Rend. Soc. Biol. Paris, 54* (*1902*), *No. 4, pp. 114–116*).—The author describes in detail the pathological processes which develop during this disease, in the skin, subcutaneous tissue, lungs, stomach, and liver.

The existence in all lesions of virulent sheep pox and in the blood of animals affected with this disease, of special bodies of a definite structure, and their structural and developmental similarity to the sporozoa, F. J. Bosc (*Compt. Rend. Soc. Biol. Paris, 54* (*1902*), *No. 4, pp. 117–119*).—The author reports the finding of peculiar bodies in the lesions of sheep pox which bear close resemblance to sporozoa. Sections were made of the diseased tissue, and a number of staining methods were tried with considerable success in differentiating the bodies. A number of forms of this organism were observed and were apparently stages in reproduction by the karyokinetic method.

True epithelioma in the liver in cases of sheep pox, F. J. Bosc (*Compt. Rend. Soc. Biol. Paris, 54* (*1902*), *No. 9, pp. 271, 272*).—The author describes in detail the general appearance of the liver of sheep affected with pox, and also the pathological histology observed in this organ. The liver may become much enlarged and exhibit symptoms of fatty degeneration, nodular hypertrophy, vascular lesions, and a true cancerous condition or epithelioma of trabecular origin.

Sheep scab, J. Spencer (*Virginia Sta. Bul. 124, pp. 39–46, figs. 4*).—Brief popular notes on the symptoms, treatment, and method of dipping sheep for this disease.

The stomach worm, J. Spencer (*Virginia Sta. Bul. 126, pp. 53–58*).—*Strongylus contortus* is reported as causing considerable losses, especially among sheep. Notes are given on the means of infection, symptoms, treatment, and post-mortem appearances of this disease.

Heart water in sheep and goats, D. Hutcheon (*Agr. Jour. Cape Good Hope, 20* (*1902*), *No. 11, pp. 633–639*).—The symptoms of the disease are described, and an account is given of the agency of ticks in carrying the disease, and of various experiments in the use of bile and blood serum treated in different manners for the purpose of producing immunity to the disease. These notes are based chiefly on the experiments by Dixon and Spreull.

Lungworm disease among members of the deer family in Bohemia, G. Zaufal (*Ztschr. Thiermed., 5* (*1901*), *No. 2–3, pp. 148–159*).—For a number of years especially since 1886, epizootics of considerable extent have been observed among different species of deer in various parts of Bohemia. At first the death of the game was supposed to be due to unusual exposure in cold weather and the consequent contraction of pneumonia and other affections of the lungs. Later, however, it was observed that certain species of lungworms are invariably present in outbreaks of the disease and these worms were subsequently shown to be the cause of the disease. Notes are given on the post-mortem findings in a number of cases. It was found that the species of worms which cause the lungworm disease of deer in Bohemia are *Strongylus filaria* and *S. commutatus*. The author calls attention to the importance of the infestation of other animals by these worms in preventing the lungworm disease among deer. A considerable percentage of the hares which were examined were found to be infested with the same species of worm which caused the lungworm disease in deer, and it is believed that the infestation of hare may be responsible in some degree for the spread of the disease during the year.

A few diseases of the hog, A. T. PETERS (*Missouri State Bd. Agr. Rpt. 1902, pp. 399-405*).—Notes are given on various diseases of the respiratory organs, especially coughing in young pigs and verminous pneumonia; and on diseases of the mouth, intestinal parasites, and paralysis of the hind legs. Where hogs become badly infested with lice it is recommended that they be dipped at frequent intervals. For this purpose the various coal-tar preparations, such as zenoleum and chloronaphtholeum are considered effective.

Swine fever, A. H. BERRY (*Jour. Comp. Path. and Ther., 15 (1902), No. 1, pp. 1-21*).—In this paper the author gives a general account of hog cholera, including its introduction and spread in Great Britain; symptoms of the disease in the peracute, acute, and chronic forms; methods of taking the temperature of diseased pigs; normal and pathological conditions in the alimentary tract which may be mistaken for hog cholera; pathological lesions of the disease; and the mortality in various localities. Attention is called also to the modes of infection, period of incubation, and methods of applying disinfectants so as to prevent undue distribution of the disease.

A preliminary report on glanders, S. B. NELSON (*Washington Sta. Bul. 50, pp. 28, pls. 5*).—The station began experiments with mallein 6 years ago, and in the present bulletin records of 76 animals treated with mallein are brought together. Of this number 36 reacted, while 40 failed to react. In 33 of the cases which reacted external symptoms of glanders were present. Notes are given on the symptoms of all the cases.

A number of experiments were planned to test the effect of repeated inoculation with mallein. In 1 experiment a horse received 1 cc. of mallein at first, the injection being repeated 1 week later, and thereafter at shorter intervals until the injection was given daily, when the amount was increased by 0.25 cc. daily until the daily injection reached 7 cc. The treatment was continued from February 2 to July 15. During the treatment the animal lost in flesh, but gained somewhat after the treatment was discontinued. The animal died in November, and it was found that the lungs were partly filled with pus and the nasal mucous membrane was covered with ulcers. In a second test an animal received 1 cc. of mallein monthly. The animal died after the experiment had been continued for 5 months. The post-mortem examination disclosed the presence of farcy buds and ulcers on the upper portion of the air passages. In the third test a mule received 1 cc. of mallein at the first injection, and injections were repeated at monthly intervals, being doubled each time. This animal also died during the course of the experiment, and post-mortem examination showed abundant evidence of active glanders. In the fourth experiment mallein was injected at weekly intervals, beginning with doses of 1 cc. and being increased 1 cc. each week. The experiment lasted from April until July, when the animal died in a greatly emaciated condition. Glanderous tubercles were found in both lungs. A fifth experiment was conducted for the purpose of testing the subject of infection of glanders. A horse which was shown by mallein test not to have glanders was turned into a corral with 2 glanderous horses on July 17. The animal failed to react to mallein on September 14 and also during October. On December 1 the animal was shot for the purpose of examination, and no evidence of glanders was found. An experiment in direct inoculation was made in which glanderous material was rubbed into the mucous membrane of the nose. This operation was performed on June 17, and on November 28 the animal died, showing the characteristic lesions of glanders. Popular notes are also given on the cause and methods of transmission, symptoms, and eradication of glanders.

Glanders in South Africa, R. C. COCHRANE (*Jour. Comp. Path. and Ther., 15 (1902), No. 1, pp. 31–40, figs. 3*).—It is stated that during the South African war the number of cases of glanders among horses in South Africa increased greatly. A part of this increase was due to the fact that the nature of the disease was not recognized by the horse owners, and healthy animals were allowed to come in contact with diseased ones. Of 12,540 horses and mules admitted to a hospital for examination, 315, or 2.5 per cent, were found to be affected with glanders. Some of these gave both a local and temperature reaction, while others gave either the temperature reaction alone or simply the local reaction. Detailed notes are given on the history of 11 cases for the purpose of indicating the accuracy of mallein as a test for glanders. Further experiments were made in inoculating donkeys and other animals for the purpose of testing the virulence of glanderous virus.

Clinical notes on African horse sickness, J. T. COLEY (*Jour. Comp. Path. and Ther., 14 (1901), No. 4, pp. 373–376, fig. 1*).—Notes are given on the symptoms, pathological anatomy, and treatment of this disease. A large number of remedies were tested, but no satisfactory results were obtained except from the intravenous injection of a solution containing 4 grains of iodin and 15 grains of potassic iodid in 1 dram each of glycerin and boiling water.

The veterinary inspection of imported American horses, P. T. HOWARD (*Jour. Comp. Path. and Ther., 14 (1901), No. 4, pp. 336–342*).—Notes are given on the usual forms of disease which are found in imported horses either as a result of infection during shipment or from previous infection. It is stated that cases of glanders observed among horses imported from America are rare, the total number recorded being 6. For the purpose of preventing the spread of infectious diseases the author recommends careful inspection of all horses when landed and isolation of diseased ones, a more vigorous inspection at the time of embarkation, and disinfection and ventilation of devices used for transporting animals.

Ship pneumonia, E. E. MARTIN (*Jour. Comp. Path. and Ther., 14 (1901), No. 4, pp. 343–345*).—The form of pneumonia which usually develops among horses on board ships is compared with that which is most frequently observed on land. In case of the land form of pneumonia, there is a specific course of the disease marked by a definite crisis. The appetite is lost, constitutional symptoms are well marked, gangrene is quite exceptional, and there is a good percentage of recoveries. In ship pneumonia, on the other hand, the disease runs an irregular course, sometimes resembling that of septic intoxication, the appetite often remains good, the constitutional symptoms are irregular, gangrene of the lungs is always observed, and recovery is rare. Ship pneumonia is considered a true gangrene of the lungs. It is possible that the large percentage of mortality from ship pneumonia may be due to badly ventilated quarters on board ship.

Combating pneumonia by serum treatment, MIECKLEY (*Arch. Wiss. u. Prakt. Thierh., 28 (1902), No. 1–2, pp. 102–109*).—A series of experiments was conducted by the author for the purpose of determining the value of disinfection of stables in outbreaks of this disease and of the application of serum treatment. Disinfection of stables was not very successful, and negative results were obtained from inoculation with serum.

Nodular peribronchitis of the horse, of a verminous origin, E. LIÉNAUX (*Ann. Med. Vet., 51 (1902), No. 2, pp. 80–88, fig. 1*).—A description is given of cases in which nodules were found in the walls of the bronchi. The contents of these nodules were often found to be in process of degeneration of a caseous or calcerous nature. Cases of nodular peribronchitis may readily be distinguished from glanders by the fact that in the former disease the corresponding lymph glands are not affected, while in glanders they are usually swollen and pathologically altered.

Mange in horses, J. SPENCER (*Virginia Sta. Bul. 125, pp. 47–52, figs. 2*).—This disease broke out among horses in Tazewell and Giles counties, Virginia. Notes are given on the symptoms and means of transmission of this disease. A 2 per cent solution of chloro-naphtholeum was applied to the horses twice a week until the symptoms disappeared.

Malignant mold fungus disease of horses, J. de Haan (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 15, Orig., pp. 758–763, figs. 2*).—The author described a disease of horses caused by a mold fungus, and which was characterized by lesions of the skin and mucous membranes. The mucous membrane of the mouth, lips, and nose are most susceptible to attacks of the disease. The pathological process gradually spreads to tissue surrounding the primary focus, without regard to the kind of tissue involved. The process extends more rapidly in the mouth cavity than in the skin. Experiments in the administration of iodid of potash indicate that this remedy may have in some cases a beneficial effect. Otherwise the diseased patches should be removed at once by operation.

Wandering bot-fly larvæ, C. Leknes (*Norsk Vet. Tidsskr., 14 (1902), No. 1–2, pp. 39–42*).—The author reports in detail observations made on a horse infested with bot-fly larvæ. A number of the larvæ were found under the skin, in which situations they produced abscesses of considerable size. Eleven such abscesses were found in the lumbar region of the animal, and others were observed on other parts of the body.

Tibio-peroneal neurectomy for the relief of spavin lameness, W. E. A. Wyman (*New York: W. R. Jenkins, 1902, pp. 30, fig. 1*).—The author presents a detailed description of this modification of the operation for the relief of spavin lameness. In all, 91 operations of this sort were performed. Of this number there was a healing of the tibial wound in 65 cases, while the peroneal site healed in 40 cases by first intention; muscular hernia occurred in 8 cases, loss of the hoof in 3 cases, and septic infection in 1 case. Four cases remained lame. There was a complete removal of lameness in 55 cases, while a slight lameness persisted in 18 cases.

Diagnosis of anthrax, O. Hosang (*Arch. Wiss. u. Prakt. Thierh., 28 (1902), No. 3–4, pp. 372–380*).—In experiments instituted by the author it was found that when material from animals dead with anthrax was smeared on a cover glass in a thick layer and allowed to dry, the anthrax bacilli retained their virulence for 2 or 3 days. During these experiments it was found that blood and spleen tissue which were taken from mice or guinea pigs 2 days after death and preserved for 3 days at a living temperature, were still capable of producing infection in healthy mice. Blood and spleen tissue taken from guinea pigs 4 days after death and preserved for from 24 to 48 hours were still virulent for the majority of mice on which experiments were made, as shown by the fact that 7 out of 8 inoculated mice died of anthrax. It is believed by the author that this method of placing a thick layer of infected tissue or other material upon a cover glass and allowing it to dry is a valuable one and permits the preservation of the material in a virulent condition for a reasonable length of time.

The pyocyanase of Emmerich and Leow in experimental anthrax, L. Tavernari (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 15, Orig., pp. 786–793*).—Experiments on guinea pigs and a rabbit indicated the favorable effect of the use of pyocyanase, in that death from experimental anthrax was postponed for considerable time. Pyocyanase, however, appeared not to have the effect of preventing a fatal outcome of the disease. The edematous swellings observed in experimental animals after inoculation were developed to a much less extent when the animals were treated with pyocyanase.

Some observations on the Bacillus anthracoides, F. A. Bainbridge (*Jour. Path. and Bact., 8 (1902), No. 1, pp. 117–120*).—The author's observations on this organism were made on material obtained from Chinese horsehair, which had already been subjected to a boiling temperature long enough to destroy all except spore-bearing organisms. The anthrax bacillus was also found associated with *B. anthracoides*. The latter organism is described as a straight, short, thick rod, which usually forms chains of 8 or 10 bacilli, is motile, stains with aniline dyes, and does not decolorize by Gram's method. Spore formation takes place after 18 hours' growth, at a temperature of 37° C. The organism may be cultivated on all ordinary media and growth takes place best at a temperature of 37° C. The bacilli are destroyed by exposure to a temperature of 72° C. for 10 minutes, and the spores were killed by being maintained at 100° C. for 5 minutes. Mice when inoculated with this bacillus invariably died in less than 48 hours. The spleen was found enlarged. Guinea pigs inoculated with 1 cc. of a culture of the organism developed an inflammatory nodule at the point of inoculation, or in some cases appeared to be infected. The organism in question resembles closely the anthrax bacillus, but differs from it, however, in its motility and its very limited pathogenic powers.

Anthrax in dogs, LÜPKE (*Deut. Tierärztl. Wchnschr., 9 (1901), No. 48, pp. 485–489*).—In the author's opinion the usual text-book statements concerning the prevalence and seriousness of anthrax in dogs is inadequate. The matter is frequently treated as if anthrax was an exceedingly rare disease in dogs. Attention is called to the frequency of the occurrence of anthrax in dogs and a number of examples are cited where dogs became fatally infected from eating the meat of animals dead of anthrax. The usual symptoms of anthrax in dogs are described in detail.

Rabies, D. E. BAUGHMAN (*Amer. Vet. Rev., 26 (1902), No. 2, pp. 115–123*).—Attention is called to the recent controversy in which the existence and nature of rabies have been involved. The author gives a critical review of some of the more important literature on the subject, and accepts the view that rabies is a real disease, produced by a virus which may be communicated by means of the bites of dogs and other animals.

Antitoxin in distemper, H. A. STEVENSON (*Jour. Comp. Med. and Vet. Arch., 23 (1902), No. 2, p. 116*).—In a case of dog distemper, in which all of the usual symptoms were present and in which the ordinary remedies failed to produce the desired result, Mulford's distemper antitoxin was used in doses of moderate size and caused a decided improvement in the condition within 24 hours. After 48 hours the discharge from the nose was checked and a complete recovery took place inside of one week.

Malignant jaundice in the dog, W. ROBERTSON (*Jour. Comp. Path. and Ther., 14 (1901), No. 4, pp. 327–336, figs. 5*).—The author describes in detail the symptoms of this disease and briefly reviews the literature of the subject. Notes are given on the post-morten lesions found in dogs affected with the disease and on the nature of the blood parasite. Numerous remedies were tried without much success. The best results were obtained from the administration of calomel and quinin. Evidence is presented to show that the blood parasite which causes this disease is conveyed from one animal to another through the agency of the dog tick (*Hæmaphysalis leachi*).

Intravenous injections of corrosive sublimate, A. SERAFINI (*Pub. Ist. Univ. Padova, 2 (1902), XIV, pp. 17; extr. from Riforma Med., 18 (1902), No. 79–80*).—Experiments in intravenous injections of corrosive sublimate indicated that this substance does not exercise a germicide action upon the organisms of anthrax and fowl cholera in solution in the ratio to the weight of the body of 1:360,000 or in the ratio to the weight of the blood of 1:30,000. The author does not believe that this method can become of general therapeutic value in the treatment of infectious diseases.

The causes which determine the absence of phagocytosis in the last stages of fowl cholera in rabbits, B. WERIGO (*Arch. Med. Exper. et. Anat. Path., Paris, 1. ser., 14 (1902), No. 2, pp. 156–202*).—The author conducted a large number of experiments, during which rabbits were inoculated with organisms of fowl cholera. It was observed that during the last stages of the disease the phenomenon of phagocytosis was absent. The author investigated the cause of this phenomenon and concludes that the absence of phagocytosis in the last stages of the disease does not depend upon any changes in the phagocyte cell. It is also believed that a change of the medium or the saturation of the organic liquids with the bacterial toxins can not be considered as causing a cessation of phagocytosis, except to a very limited extent. The two causes of the absence of phagocytosis are believed to lie principally in alterations in the bacteria which protect them against the phagocytes. During the first stages of the disease the bacteria appear to exercise an irritating effect upon the phagocytes, by means of which the former become located and are surrounded and destroyed by the phagocytes. Later this influence appears to be lost and the phagocytes seem to be unable to find the pathogenic organisms.

Bacillar septicemia in chickens, F. FUHRMANN (*Mitt. Naturw. Ver. Steiermark, 1901, No. 38, pp. 248–255, pl. 1*).—The author investigated a disease of chickens which ran a course without producing any observable pathological changes in the internal organs. Detailed notes are given on the behavior of the bacillus on various nutrient media. The bacillus did not coagulate milk and was decolorized by Gram's method. From 2 to 4 flagella were observed on each bacillus. No spore formation occurred. The optimum temperature was about that of the body. Pigeons and mice were found to be immune to subcutaneous and intramuscular infection. Chickens, spotted rats, rabbits, and guinea pigs, on the other hand, were very susceptible. So far as the author's observations go, the filtrates from cultures of bacillus are not toxic. It is believed that the organism in question belongs to the group of coli bacillus.

Goose septicemia, C. CURTICE (*Rhode Island Sta. Bul. 86, pp. 189–203*).—A serious outbreak of a fatal disease among geese occurred in a feeding plant at Adamsville, R. I. Among a large number of geese which had been bought in different parts of the State about 3,200 were affected and died. The death rate averaged from 5 to 30 per day and reached 60 on 1 day. A similar outbreak occured at Little Compton, during which 500 geese, or about 20 per cent of the whole flock, died. The symptons of the disease were seldom observed in their entirety. Some of the geese died within 5 minutes after the first appearance of the disease, and as a rule the course of the disease was not longer than 36 hours. Apparently no cases recovered. Post-mortem examinations showed quantities of mucus in the throat and nose, congestion of the blood vessels of the head, catarrhal products in the intestines, small hemorrhages in the walls of the intestines, and minute yellow or whitish spots on the liver. The bacteriological work was chiefly performed by Dr. Theobald Smith, whose notes are included in the bulletin. A bacterial organism was isolated by Dr. Smith from the blood, liver, or mucous exudate of the affected geese. The organism is oval and stains at the poles. It belongs to the group of hemorrhagic septicemia. Inoculation experiments showed that this bacillus is pathogenic for rabbits, guinea pigs, pigeons, mice, ducks, and geese, whether administered hypodermically or by way of the mouth. Young geese fed on small pieces of the intestine and liver from diseased geese were found dead the next morning and they showed similar post-mortem appearances to those observed in cases of natural infection. It is believed that infection in geese takes place by way of the mucous membrane of the head. Experiments with hens indicate that this animal is immune to the disease, while in 1 case ducks were not affected by feeding with virulent material, but succumbed to hypodermic inoculation. It is suggested that while infection takes place through the mucous membranes of the head, it probably occurs only in animals in which there are lesions of these membranes. Treatment must be preventive, medicinal treatment being useless. On the premises where the most serious outbreak occurred the geese were fed in lots of 300. It is suggested that they be divided into smaller lots, and that the premises be thoroughly disinfected from time to time. After the larger outbreak mentioned above had occurred the feeding plant was used for fattening ducks without any case of the disease having appeared in the latter.

Diphtheria of birds, C. GUÉRIN (*Ann. Med. Vet., 51 (1902), No. 5, pp. 259–272*).—A careful study was made of the symptoms, pathogenesis, and treatment of this disease. An organism was isolated which, when inoculated into healthy birds produced the same symptoms which were observed in cases of natural infection. The pigeon was found to be most susceptible to the disease. In this bird the virulence of the organism was increased and fixed by repeated inoculations. Experimental transmission of the diphtheria of birds was found to be an easy matter in the pigeon, both by inoculation and by injection of virulent products, especially the excretions of diseased birds. It was found possible to produce an active permanent immunity to the disease in susceptible animals by inoculation of an attenuated virus into the peritoneal cavity. Hypodermic inoculations were without effect. An antibacterial preventive serum was obtained from a horse by means of which active immunity could be produced in susceptible animals through serum vaccination.

Infestation of ducks with Dermanyssus avium, R. KLEE (*Deut. Tierärztl. Wchnschr.*, *9* (*1901*), *No. 1, p. 3*).—An account is given of a serious infestation of ducks from this mite. It is recommended that ducks be kept in special inclosures or buildings and not allowed to occupy buildings along with chickens and pigeons, since infestation by this mite may be thus spread from the pigeons and chickens to the ducks.

AGRICULTURAL ENGINEERING.

Irrigation of rice in the United States, F. BOND and G. H. KEENEY (*U. S. Dept. Agr.*, *Office of Experiment Stations Bul. 113, pp. 77, pls. 29, figs. 10*).—In this bulletin Mr. Bond describes the rice industry of Louisiana and Texas, and gives measurements of the quantities of water used in irrigating rice in these States. He also discusses the water laws and the difficulties which have arisen from overappropriation of the streams. Mr. Keeney's report deals with the rice industry in the South Atlantic States (North Carolina, South Carolina, and Georgia), and is almost wholly descriptive.

The control of water from melted snow by means of terraces, P. JANKOVSKI (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *3* (*1902*), *No. 3, pp. 348–354*).

List of references to publications relating to irrigation and land drainage, ELLEN A. HEDRICK (*U. S. Dept. Agr.*, *Library Bul. 41, pp. 181*).—The list, which was prepared in cooperation with this Office, "includes references to irrigation and land drainage principally, but . . . includes, also, references to a few allied subjects, such as hydraulics, and some departments of engineering. No attempt has been made to catalogue articles in periodicals except in the following cases, namely: Transactions and Proceedings of the American Society of Civil Engineers, Transactions and Proceedings of the Technical Society of the Pacific Coast, Minutes of the Proceedings of the Institute of Civil Engineers, Journal and Proceedings of the Royal Society of New South Wales, and Annales des Ponts et Chaussées: Mémoires et documents. The work has been done in the libraries of Washington containing the largest collection of books on the subjects mentioned. Books which are available for reference in these libraries are indicated by abbreviations after the entries."

Tests of agricultural machines at Plessis, E. LEPLAE (*Rev. Gén. Agron.* [*Louvain*], *11* (*1902*), *Nos. 7–8, pp. 376–382; 9, pp. 390–394, fig. 1*).—This article refers briefly to Ringelmann's work in the testing of agricultural machinery, and discusses the development and perfecting of the plow and steam cultivation.

Report on agricultural implements and machines at the agricultural exposition of Hasselt in 1900, J. PYRO (*Bul. Agr.* [*Brussels*], *18* (*1902*), *No. 4, pp. 549–593*).—A brief discussion of the relative merits of different forms of plows, grain seeders, fertilizer distributors, harvesting and thrashing machines, rakes, mills, feed cutters, petroleum locomobiles, etc., displayed at this exposition. Attention is also called to a simple but apparently efficient device for equalizing tension and transmitting force, in case of horses, without shock.

Notes on the application of cold to agricultural products in commerce (*Rev. Gén. Agron.* [*Louvain*], *11* (*1902*), *No. 7–8, pp. 368–375*).—Brief notes are given on the commercial application of cold in the storage and transportation of agricultural products.

MISCELLANEOUS.

Fifteenth Annual Report of Maryland Station, 1902 (*Maryland Sta. Rpt. 1902, pp. VIII + 201*).—This contains the organization list of the station; a report of the director enumerating the lines of work pursued by the different departments and giving notes on the station library, agricultural museum and exhibits, etc.; observations on precipitation and temperature; and a financial statement for the fiscal year ended June 30, 1902. Reprints of Bulletins 77–84 of the station on the following subjects are appended: The comparative digestibility of raw, pasteurized, and cooked milk (E. S. R., 13, p. 674); dehorning of stock (E. S. R., 13, p. 895); the disinfectant properties of washing powders (E. S. R., 13, p. 1020); acute epizoötic leucoencephalitis in horses (E. S. R., 14, p. 91); soils and fertilizers for greenhouse crops (E. S. R., 14, p. 38); thinning fruits (E. S. R., 14, p. 253); an inquiry as to the causes of pithiness in celery (E. S. R., 14, p. 250); and some feeding experiments with cows (E. S. R., 14, p. 487).

Proceedings of the fifteenth annual convention of the Association of American Agricultural Colleges and Experiment Stations, A. C. True, W. H. Beal, and H. H. Goodell (*U. S. Dept. Agr., Office of Experiment Stations Bul. 115, pp. 134, fig. 1, charts 8*).—This is a detailed account of the proceedings of the convention held at Washington, D. C., November 12–14, 1901 (E. S. R., 13, p. 507).

Statistics of the land-grant colleges and agricultural experiment stations in the United States for the year ended June 30, 1901 (*U. S. Dept. Agr., Office of Experiment Stations Bul. 114, pp. 39*).—A summary of the statistics relating to the stations appeared in E. S. R., 13, p. 700.

Agricultural experiment stations and experimental fields, L. Grandeau (*Jour. Agr. Prat., n. ser., 4 (1902), No. 38, pp. 365–367*).—This article traces briefly the history of agricultural experiment stations in France and explains and illustrates the work they may do for the benefit of agriculture.

Demonstration fields—their organization, object, and uses, L. Grandeau (*Jour. Agr. Prat., n. ser., 4 (1902), No. 37, pp. 337–340*).—This article explains the practical usefulness of demonstration fields and urges their more general establishment throughout France.

History of Ohio agriculture, C. W. Burkett (*Concord, N. H., 1900, pp. 211, pls. 4*).—This book gives an account of the progress and evolution of agriculture in Ohio. Soil, climate, special means of transportation, crops of various kinds, stock raising, farm implements and machinery, and agricultural education are discussed.

Report on Hungarian agriculture, C. Baudoüin (*Bul. Min. Agr. [France], 21 (1902), No. 2, pp. 441–450*).—A brief report on agriculture in Hungary, containing in addition to some general statements and statistics notes on rotation of crops, the use of fertilizers, pasturing, and the culture of corn, oats, forage beets, and catch crops as practiced in that country.

Sources of the agricultural imports of the United States, 1897-1901, F. H. Hitchcock (*U. S. Dept. Agr., Section of Foreign Markets Bul. 28, pp. 132*).—Of the agricultural imports of the United States during the fiscal year 1901 Brazil supplied 13.65, Cuba 9.88, the United Kingdom 7.53, Germany 7.19, Japan 5.26, and France 5.15 per cent. The total value of the agricultural imports during 1901 was $391,931,051 and the average value for the 5 years covered by this report was $376,549,697. A similar statistical report for the years 1896–1900 was published as Bulletin 24 of the Section (E. S. R., 13, p. 494).

Distribution of the agricultural exports of the United States, 1897-1901, F. H. Hitchcock (*U. S. Dept. Agr., Section of Foreign Markets Bul. 29, pp. 202*).—Of the agricultural exports of the United States during the fiscal year 1901, the United Kingdom received 52.16, Germany 15.22, the Netherlands 5.36, and France 5.28 per cent. The total value of the agricultural exports during 1901 was $951,628,331, and the average value for the 5 years covered by this report was $827,566.147. A similar statistical report for the years 1896–1900 was published as Bulletin 25 of the Section (E. S. R., 13, p. 494).

Agricultural returns for Great Britain for 1901 (*London: Board of Agriculture, pp. 27*).—Tables showing the estimated total produce and average yield per acre of the principal crops, with particulars for each county of Great Britain and a summary for the United Kingdom.

Crop statistics for the Northwest Territories in 1901 (*Rpt. Dept. Agr. Northwest Territories, 1902, pp. 25–32*).—A full account is given of the manner in which crop statistics are obtained. A table shows the total and average yield and the acreage of wheat, oats, and barley for 1898–1901, inclusive.

By-products of the starch industry in the United States (*Jour. Soc. Arts, 50* (*1902*), *No. 2592, pp. 737, 738*).—A brief note on by-products obtained in the manufacture of starch from cassava, potatoes, corn, wheat, and rice.

The utilization of wastes and by-products, H. G. Kittredge (*Twelfth Census United States, Census Bul. 190, pp. 26*).—A general discussion of the uses made of the by-products and wastes of various industries, as follows: Iron and steel, lumber and timber, paper making, slaughterhouse products, woolen and cotton industries, cotton oil, leather, dyeing, silk, starch, old rubber, breweries, tin, mussel shells, glass, ashes, corn pith, glycerin, printers' ink rollers, powdered milk, and corn oil.

Notes on miscellaneous work, P. Bonâme (*Rap. An. Sta. Agron.* [*Mauritius*], *1901, pp. 25–37*).—Brief notes are given on the character of the season of 1901–2 in Mauritius as affecting the yield and quality of crops, especially sugar cane; the fertilizing value of organic nitrogen from different sources; the composition and food value of corn meal; the composition of twigs of *Typhonodorum lendleyanum;* and the damage caused by rats on sugar plantations with means of prevention.

Index to the yearbooks of the U. S. Department of Agriculture, 1894–1900, C. H. Greathouse (*U. S. Dept. Agr. Division of Publications Bul. 7, pp. 196*).—This is a combined subject and author index and is essentially a continuation of an index to the annual reports of the Secretary of Agriculture for 1837 to 1893 published as Bulletin 1 of the Division.

NOTES.

ALABAMA COLLEGE AND STATION.—C. C. Thach, president of the college, has been made acting director of the station. R. S. Mackintosh, assistant horticulturist of the Minnesota Station, has been elected professor of horticulture in the college, and horticulturist of the station. The department of horticulture has been separated from that of biology, and the chair made a full professorship. The greenhouses are being repaired, and improvements made in other station buildings.

COLORADO COLLEGE AND STATION.—At a recent meeting of the State board of agriculture Miss Theodosia G. Ammons, professor of domestic economy, was made dean of women's work in the college. W. R. Thomas has resigned from the board to become professor of constitutional and irrigation law. J. S. Titcomb, former deputy State engineer, has been made assistant in the department of irrigation engineering. A new department of electrical engineering has been established, and L. D. Crain, instructor in mechanical engineering, has been made professor. The course will be opened with the next college year, beginning September first. A new building, to be a central heating plant and also to contain rooms for the department of electrical engineering, is being constructed. An enlargement of the main building, giving increased seating capacity in the chapel, has been provided for. The State legislature will be asked for an appropriation of $75,000 for a building for the offices of the experiment station and for the department of civil and irrigation engineering. The State board of agriculture has transferred $1,000 from the college funds to the station, for expenditure under the supervision of the director.

IDAHO UNIVERSITY AND STATION.—At a recent meeting of the board of regents H. T. French, agriculturist of the station, was made director. F. A. Huntley, horticulturist of the college and station, has resigned, to take effect January 1, 1903.

KANSAS STATION.—The annual report of the station states that during the past fiscal year (1901–2) the station published 7 regular bulletins, in editions of 25,000 to 27,000 copies; an index to the bulletins for the year; and 23 press bulletins, the latter in editions varying from 3,600 to 5,000 copies, except in one instance in which 17,000 copies were printed. During the year the station commenced operations at the Fort Hays Branch Station, on a part of the old Fort Hays reservation. Fields of sorghum and Kafir corn, sown alone and mixed, barley, macaroni wheats, millet, corn, soy beans, cowpeas, *Bromus inermis*, alfalfa, Kansas stock melons, peanuts and garvansas, and potatoes were grown, a grass garden with 31 varieties was started, and about three-fourths of an acre set to trees and shrubs sent out by the college. The chief objects of the Fort Hays branch are the testing of plants and methods of culture with special reference to the needs of regions having deficient rainfall. In large part these experiments are expected to be upon a rather extensive scale, but performed with careful attention to all details, so as to yield results of scientific accuracy. The cooperative experiments of the station with this Department in the testing and breeding of cereals and in range improvement and forage-plant investigations will be conducted largely at the Fort Hays branch. Few of the buildings on the reservation could be used when repaired.

INDIANA STATION.—H. A. Huston, director of the station, has resigned to accept a position with the German Kali Works, in charge of their new branch office to be opened at St. Louis, Mo. This branch will be run as a part of the propaganda and will be purely educational. The territory covered by the St. Louis office will extend from eastern Ohio to Colorado and from Arkansas to Minnesota. Professor Huston will take up his new duties in April next.

IOWA COLLEGE AND STATION.—At a recent meeting of the trustees it was decided to devote the one-fifth mill tax levy granted by the last legislature for building purposes to the erection of the following buildings in the near future: A fire-proof addition to Agricultural Hall, 60 by 100 ft., for the use of the departments of agronomy and farm mechanics, greenhouses for agronomy and horticulture, and a two-story judging pavilion for agronomy and animal husbandry 60 ft. in diameter, to cost $50,000; a central building for administration and general science purposes, to cost $225,000; a new agricultural building, to cost $200,000; and a central heating plant, to cost $60,000. The erection of the buildings will be taken up in the order named. The addition to Agricultural Hall and the other buildings for the agricultural department will be taken up first, and will be completed by the opening of the next college year. The new main building, which takes the place of the one destroyed by fire, the new agricultural building, and the central heating plant will be erected as soon as the income from the tax levy permits. The new experiment station barn has been completed.

KENTUCKY STATION.—O. M. Shedd, a graduate of the Kentucky Agricultural College, has been made assistant chemist, to succeed L. O. Beatty; and E. P. Taylor, of the Colorado Agricultural College, has been appointed assistant entomologist and botanist, to succeed T. L. Richmond. The board of trustees at the recent semiannual meeting authorized the erection of a new building, to be devoted exclusively to the station, and costing $20,000. This will be erected on a parcel of ground recently purchased for $4,000, and lying between the college campus and the station farm. The building will contain the offices of the different divisions of the station and their laboratories.

MINNESOTA STATION.—Beyer Aune, a graduate of the University of Minnesota, has been appointed foreman of the station farm.

NEBRASKA UNIVERSITY AND STATION.—A. T. Wiancko, instructor in agriculture in the university and assistant agriculturist of the station, resigned January 1 to go to Purdue University, where he will be connected with the instruction in agriculture, and will have charge of the field experiments of the Indiana Station.

CORNELL UNIVERSITY AND STATION.—The announcement is made that G. C. Caldwell has retired from active service, in accordance with the recent regulations of the trustees permitting professors to retire with pension. Professor Caldwell has been at the head of the chemical department of the university since 1868, and chemist of the station since its establishment. John W. Gilmore, B. S. A., has entered upon his duties as agriculturist of the station. Mr. Gilmore has recently returned from the Philippine Islands, where he was connected with agricultural work, and previous to that spent a year in Hawaii and two years in China engaged in teaching agriculture.

OHIO STATION.—At a recent meeting of the board of control of the station it was decided, in view of the great increase in the work and responsibilities of the agricultural department, to divide that department into the two administrative departments of agriculture and animal husbandry, and C. G. Williams, of Gustavus, Ohio, was appointed chief of the agricultural department and superintendent of the farm. Mr. Williams is a successful and progressive young farmer who is widely known over the State as an agricultural writer and a farmers' institute speaker. The appointment of a chief of the department of animal husbandry will be made at a later date.

Rhode Island College and Station.—Kenyon L. Butterfield has been elected president of the college and will enter upon his duties about April first. Mr. Butterfield was for several years superintendent of farmers' institutes in Michigan and is at present instructor in rural sociology in the University of Michigan, where he has been taking post-graduate work. T. G. Mathewson, of East Greenwich, has been appointed president of the board of managers to succeed H. L. Greene, resigned. L. P. Sprague, assistant horticulturist of the station, has resigned, and A. E. Stene, of Cornell University, has been appointed to succeed him.

South Carolina Station.—A new barn for the station has recently been completed, and registered representatives of the beef and milk strains or breeds are being placed in it.

Vermont Station. The general assembly, recently adjourned, has replaced the fertilizer and feeding stuffs inspection laws, passed respectively in 1888 and 1898, with new enactments. A brand tax has been substituted for a blanket license as a means of raising revenue for the enforcement of the fertilizer law, and a small appropriation has been voted the station for use in feeding stuffs inspection, thus doing away with the cumbersome and unsatisfactory tag tax system hitherto in vogue. The fertilizer law has been drawn in substantial conformity with the recommendations contained in the report of the committees on fertilizer legislation of the Association of American Agricultural Colleges and Experiment Stations and of the Association of Official Agricultural Chemists. A joint resolution was passed requesting the station to investigate the seed trade of the State, and to report to the next general assembly such findings and recommendations as are deemed wise and will contribute to the enhanced purity of grass and similar seeds.

Wisconsin University and Station.—T. F. McConnell, instructor in animal husbandry in the college of agriculture and assistant in the station, has been elected to the chair of animal husbandry in the Arizona University and Station.

U. S. Department of Agriculture.—Another building for the use of the Department has been erected by private enterprise. The new building is to accommodate the botanical work of the Bureau of Plant Industry, and is located on Twelfth street near the Department grounds. It is 85 by 40 ft. and 3 stories in height, with a large basement. The building has about 35 rooms above the basement, most of them of good size and well lighted. The basement will contain 4 large workrooms, 2 of these to be used for seed germination, and 2 as laboratories for investigations of drugs and medicinal plants and of poisonous plants, respectively. The first two floors will be given up to office and laboratory rooms for the pure seed investigations, drugs and medicinal plants, and poisonous plants; and the third floor will accommodate the cereal investigations, the tropical agricultural work, and the fiber plant investigations, and will contain a general photographic room and 2 dark rooms. The building was ready for occupation January 1. It serves to bring together the work in botanical lines which heretofore has been quite widely scattered.

Society of Official Horticultural Inspectors.—The second annual meeting of this society was held at Atlanta, Ga., October 6, 7, and 8, on the occasion of the convention of the Association of American Agricultural Colleges and Experiment Stations. Representatives were present from Florida, Georgia, Illinois, Massachusetts, New Jersey, New York, Pennsylvania, South Carolina, and Virginia. The sessions were presided over by S. A. Forbes, of Illinois, and W. M. Scott, of Georgia, acted as secretary. We are indebted to the courtesy of the latter for this account of the meeting. The proceedings took the form of discussions of topics suggested in a preliminary programme, rather than the presentation of set papers. At the conclusion of the discussion of each topic the views of the delegates on that point were recorded in a resolution offered by some member.

Upon the first topic, Interstate Comity with Respect to the Certification of Nurseries, the unanimous opinion of the delegates was to the effect that the examining or certifying officer of each State accept at its face value the statements made in certificates duly granted under the laws of other States, so far as the laws of his own State admit, unless information at hand creates a reasonable doubt as to the regularity of the certificate or its application.

The discussion of the second topic, Exchange of Communications with Reference to Receipt of Diseased Nursery Stock Originating in Other States, was brief, as all present appeared to be of the same mind, viz, "that the inspectors of the several States should freely and frankly exchange communications with regard to nursery infestation, and that each should notify every other of such cases of infestation and attempts at evasion of the laws as might from time to time come to his notice."

The third topic related to Interstate Cooperation for the Control of Horticultural Pests whose Area of Distribution Extends Across State Lines. In the discussion several cases were cited in which it was shown that cooperation was necessary to produce the desired results, and this view was expressed in the resolution adopted, which gave the preference in the treatment of any particular pest to such cases.

Upon the question, Is it Desirable that Nurserymen Should Pay Any Part or All of the Expenses of Nursery Inspection Required by Law, Either Direct or as a Fee for a Certificate? considerable difference of opinion was expressed, some holding that there should be no fees; others that the nurserymen should pay small fees, as in the case of fertilizers, etc.; others that they should take out a license at a small fee, as a matter of record for the inspector. The resolution adopted, however, was to the effect that the nurserymen should not be required to pay the expense of the ordinary inspection of nursery stock. On the related topic, Is it Desirable that the Entire Cost of Insecticide or Fungicide Measures Required by Law Should be Borne by the Owner of the Affected Property? the consensus of opinion was that the State should not bear the cost of the treatment of private premises, but that the entire cost should be borne by the owner.

Various inspectors reported upon nursery pests in their respective States whose continued presence will prevent the certification of a nursery. Mr. Smith's practice in New Jersey was to withhold certificate from nurserymen whose premises were found infested with San José scale, at least until all infestation was eliminated; stock actually infested with black knot was not certified; yellows could not be detected on nursery stock and was hardly considered as a factor in the inspection; crown gall was inspected for, so far as possible, after the stock was dug, and visibly diseased plants discarded; stock badly infested with woolly aphis was destroyed; the occurrence of *Aspidiotus ancylus*, *A. forbesi*, and *Chionaspis furfurus* would not debar the stock; the occurrence of any scale insect on imported stock would prevent certification, and the presence of *Diaspis pyricola* especially would act as a bar.

Mr. Fernald reported that in Massachusetts no certificate would be granted so long as the San José scale, *Diaspis pentagona*, *Aspidiotus ostreæformis*, gypsy moth, browntail moth, yellows, rosette, or black knot was found infesting the stock. Crown gall, he stated, had not so far been found in Massachusetts.

Mr. Gossard reported that it was his practice in Florida to withhold certificate from the owner of premises infested with San José scale until the proper steps had been taken to get rid of the pest by fumigation or otherwise. *Diaspis pentagona* occurred in the State, but so far had not been found in the nurseries. Citrus plants were commonly infested with various scale insects, but no definite action had yet been taken with respect to such cases. White-fly was so generally distributed as to render restrictive measures against it impractical, but treatment was recommended. In cases of crown gall the owners were instructed to destroy all affected plants, and root-knot infestation was also rejected.

Mr. Hamilton stated that the prevailing rule in Pennsylvania was to grant a certificate when the nursery was found apparently free from San José scale, and to withhold the certificate when this pest occurred. Mr. Butz, of the same State, explained further that in cases of crown gall, woolly aphis, and some other of the more injurious pests, the nurserymen were requested to discard badly affected stock.

Mr. Burgess reported that in Ohio the presence in a nursery of the San José scale, black knot, or peach yellows was sufficient ground for withholding certificate, and that plants infested with woolly aphis or affected with crown gall were caused to be destroyed. He stated that the oyster-shell bark louse was doing considerable damage in Ohio, and so far as practical its dissemination on nursery stock was prevented.

Mr. Phillips reported that the practice in Virginia was to withhold certificate from nurseries in which San José scale, black knot, or peach yellows was found until the trouble was effectually eliminated. Peach yellows had not so far been found in the nurseries, but diseased orchard trees in the neighborhood of a nursery sometimes occurred, and these were destroyed before a certificate was granted. The same was true of black knot. He stated further that severe cases of crown gall, woolly aphis, and pear blight were not admitted under certificate. Plants actually showing the presence of such pests were discarded.

Mr. Forbes required the Illinois inspectors to send in a statement of every pest found in the nursery, and before a certificate was granted he required the elimination of the San José scale and black knot. Precautions were taken to avoid sending out borers, woolly aphis, crown gall, and pear blight. Plants infested with woolly aphis to the extent of causing warty formations on the roots were discarded, and so also were plants visibly affected with crown gall. Noticeable infestation of the scurfy scale and bad cases of oyster-shell bark louse were rejected.

Mr. Scott stated that in Georgia the presence of the San José scale, *Diaspis pentagona*, black knot, or rosette would prevent the certification of a nursery; that stock seriously affected with crown gall, root knot, or woolly aphis was not allowed to be sent out under certificate; and that stock infested with the cherry scale, scurfy scale, or oyster-shell scale was caused to be properly treated before it was distributed. It had been his practice in suspicious cases to have the stock inspected on the heeling-in grounds for crown gall, woolly aphis, and scale insects.

Observers differed in regard to the prevalence of crown gall. This was reported as confined to the apple in Illinois and Virginia, to the peach in New Jersey and Florida, and equally common on the peach and apple in Georgia.

Mr. Engle, of Pennsylvania, called attention to the black peach aphis, which in his opinion all inspectors should rule against.

A motion was adopted calling for the appointment of a committee of three, including the chairman, to compare all existing laws concerning the control of insects and diseases in the nursery or orchard, suggest points to be covered in State legislation, and formulate suggestively uniform State and Federal legislation to regulate nursery inspection, interstate traffic, and orchard control, this committee to report at the next meeting.

With reference to the procedure taken in cases of nursery infestation with scale or other dangerous pests, Mr. Scott stated that the Georgia law prohibited the certification of a nursery when any portion of it was found infested, and that he had disposed of such cases according to the individuality of the nurseryman, as well as the circumstances attending the case, in the following manner: Case 1.—A portion of a large nursery was found infested with San José scale, and as agreed to by the owner its customers were notified of the exact conditions, with assurance that the stock actually infested would be burned and the remainder fumigated under supervision. To the surprise of both the owner and himself not a single order was countermanded and practically the entire stock was disposed of at the customary prices. Case 2.—Upon the inspection of a certain nursery a single specimen of San José scale was found upon a plum leaf, and in spite of a most careful examination no further infestation could be found at that time. A second inspection at the heeling-in grounds revealed a slight infestation of a dozen or more trees, which were thrown out. The owner would not agree to the notification of his customers as in case 1, and a certificate to cover the contents of each box was issued after a list was furnished of persons to whom the stock was intended to be shipped. Other cases were treated similarly. Case 3.—In this case the nursery was located in a section where practically all the orchards were infested and the fruit interest was sufficiently great to demand all the stock grown in this nursery. The certificate issued set forth the facts, viz, that San José scale was found in a portion of the nursery and that the proper steps had been taken to eliminate it. Under this certificate practically all the stock was disposed of at market prices.

In Pennsylvania Mr. Hamilton required under affidavit the attachment of a statement of fumigation to each shipment. In Florida Mr. Gossard required a thorough cleaning up by destruction of trees actually infested and the fumigation of the remainder. In Illinois Mr. Forbes did not require the fumigation of the entire stock when scale was found in an isolated portion of the nursery, unless the indications were that there had been a general spread of the scale. However, fumigation was required for the infested portions or for the entire stock when the infestation was general. In New Jersey Mr. Smith required the fumigation of the entire stock when scale was found in the nursery, but under no circumstances did he allow shipments of stock from infested nurseries to go outside the State. However, he did not restrict the sale of such stock within the State. In Ohio Mr. Burgess's method was to destroy all infested stock and require the fumigation of such as was dangerously near. In Massachusetts Mr. Fernald gave the owner the option of fumigation or destroying the infested stock, and in cases of general infestation a fumigation affidavit was required.

Following these statements, a resolution was adopted expressing the opinion of the meeting that nursery stock fumigated according to accepted requirements should be considered as satisfactory as stock sold under certificates of inspection only.

A paper by Mr. Smith relating to recent observations and experiments with insecticides for the San José scale, presented before the section on entomology of the general association, was discussed by the inspectors; and Mr. Fernald reported upon some recent experiments by him in Massachusetts, said to represent the most extensive work against the San José scale ever done in New England. The discussion was quite general and extended, and tended to show that the petroleum oils, whale-oil soap, and lime-sulphur-and-salt wash constitute the standard remedies for the San José scale in orchards.

The society decided to meet again next year in connection with the Association of American Agricultural Colleges and Experiment Stations. S. A. Forbes was reelected chairman, and J. B. Smith was elected to the new office of vice-chairman.

MISCELLANEOUS.—The Carnegie Institution has made a grant of $5,000 to Prof. W. O. Atwater, of Wesleyan University, for investigations on the measurement of oxygen in connection with metabolism experiments. The attempt will be made to modify the workings of the respiration calorimeter so as to introduce known amounts of oxygen into the respiration chamber to replace that used by the subject, instead of supplying the same in a current of fresh air, as at present. These investigations will be in the direction of a further refinement of the methods for studying the metabolism of nutrients in man, and are made desirable by the present status of the study which has been in progress at Middletown, in cooperation with this Department, for several years past. The determination of the oxygen balance will enable the calculation of the respiratory quotient, and will furnish much more accurate data for determining the net value to the body and the replacing power of nutrients from different sources.

The School of Practical Agriculture, recently located at Briarcliff Manor, N. Y., has moved to its new location at Poughkeepsie. No buildings have yet been erected, but two houses in the city have been rented and for the present the school will be quartered in these. As soon as funds are obtained to warrant the expenditure, a main building and laboratories will be built at the farm which has been acquired outside the city. This school, which has been popularly referred to as the Briarcliff School, will hereafter be known as the School of Practical Agriculture at Poughkeepsie.

The death is announced of Dr. T. R. Segelcke, professor of dairying in the Royal Veterinary and Agricultural College at Copenhagen. Professor Segelcke was one of the very first to take up the systematizing of butter and cheese making as based upon the observance of scientific principles of management, and has been generally recognized as the father of modern dairying in Scandinavia. For many years he carried on a propaganda for the improvement of dairy practice among the farmers in Denmark, and found an able second in Professor Fjord, who took up the experimental side. He was appointed instructor in dairying at the Royal Agricultural College in the early sixties, and in 1874 was made professor of that branch. He is said to have been the first professor of dairying appointed to any institution in the world. The number of students in the institution grew from 2 in 1864 to 189 in 1877. Professor Segelcke's lectures were very popular, and have been frequented by nearly all the teachers of dairying and the leading dairy specialists in the Scandinavian countries for 25 years past. He also held courses of two to three months in practical dairying at a large number of first-class creameries in different parts of Denmark. His popularity was shown on the occasion of the celebration of his seventieth birthday by his students last year. Of late years he had confined himself more especially to his lectures at the college, but remained at the head of the commission charged with carrying out the regulations of the oleomargarine laws.

The Chemical Physiological Experiment Station for Wine and Fruit Growing at Klosterneuburg, Austria, has been discontinued and the control work of the station united with that of the Agricultural Chemical Experiment Station at Vienna, under Dr. F. W. Dafert. The viticultural division of the Vienna Station has also taken charge of all work in that line at the Klosterneuburg Station, except the preparation of yeast cultures for wine making, which in future will be in charge of the Higher School for Wine and Fruit Culture at Klosterneuburg.

We quote the following from *Nature:* The committee of the class including agricultural practice and agricultural statistics at the Paris Exhibition of 1900 has decided to make a grant of 2,400 francs to the agricultural section of the Paris Society for the Encouragement of National Industries, to be employed in agricultural research in such a manner as the committee of the society determines. In his letter to the president of the society, M. Tisserand, on behalf of the exhibition committee, expresses satisfaction that such a grant is possible as the outcome of the work of the section of the exhibition represented by him.

A recent number of *Chronique agricole du canton de Vaud* gives an account of a very enthusiastic celebration of the seventy-fifth anniversary of the birth of Samuel Bieler, and of the twenty-fifth anniversary of his appointment as director of the Cantonal School of Agriculture. Representatives of many important agricultural societies and institutions of Switzerland participated. Professor Bieler, by public addresses, lectures, publications, and activity in various societies, has exerted a considerable influence on the progress of agriculture in Switzerland, largely by popularizing science relating to agriculture and making it available for the practical agriculturist.

The first number of *The Australian Gardener* recently reached this Office. It is a monthly journal of 16 to 18 pages and devoted mainly to floriculture. It also contains information of a practical character upon vegetable and fruit growing, and is designed for professional, practical, and amateur gardeners in Australia, New Zealand, Tasmania, and South Africa.

A school for tanning industry, the first to be established in Italy, was opened at Turin in December. The school was founded by the local association for the tanning industry.

EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, PH. D., *Assistant Director.*

EDITORIAL DEPARTMENTS.

Chemistry, Dairy Farming, and Dairying—The EDITOR and H. W. LAWSON.
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Botany and Diseases of Plants—WALTER H. EVANS, Ph. D.
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Horticulture—C. B. SMITH.
With the cooperation of the scientific divisions of the Department.

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EXPERIMENT STATION RECORD.

Vol. XIV. February, 1903. No. 6.

An interesting feature of the Washington meeting of the American Association for the Advancement of Science was a discussion, by six men selected to represent different branches of science, of the question: How Can Endowments be Used Most Effectually for Scientific Research? The occasion of this was a joint session of the biological societies with the American Society of Naturalists.

While various phases of this question were covered by the different speakers, one point quite prominently emphasized by nearly all was the prime importance of the *man*. This single factor overshadows all others in research—the theme, the equipment, the surroundings, and other material resources. Large amounts of money, magnificent laboratories, expensive and elaborate equipment do not insure research of high order, and only to a limited extent will they promote it. Men with well-developed investigating instincts are the great prerequisite. Such men will rise above their surroundings, and will accomplish results in spite of conditions which are not ideal. They will not allow a lack of the latest facilities or the best arrangement of their time to deter them from the pursuit of knowledge. This is the genius of the research worker, that his zeal and devotion and his inspiration serve to offset, if necessary, unfavorable conditions which to another would be deterrent.

Special natural traits and qualifications are required for the successful research worker. Considerable of our research work, as one speaker stated, is carried on because research is more or less of a fad—the thing for the student to do; and this often leads men and women into research work who are not suited to it by nature or capable of rising above a comparatively low level in that line of activity.

The conditions prevalent in this country, with its many opportunities and distracting influences, do not favor the highest development of the qualities necessary in the research worker. There is a lack of incentive—the opportunity for a career which other lines hold out. The position of the man of science who devotes himself to research is not assured as it is in Europe. Research work is comparatively new in our universities as yet. Men have been commonly selected for teaching mainly because of their ability as instructors, rather than as investigators in science. The commercial field holds out such financial inducements that it attracts many of the most brilliant men, and unfortunately it is not always the brightest men who take up advanced work in our universities. These influences, together with an impatience for recognition and a restlessness which often leads to superficial work, militate against the highest development of research in this country. The remedy for this is the spread of education and a more general appreciation and understanding of research.

Prof. Asaph Hall, the president of the association, expressed sentiments in line with these thoughts in his retiring address. He said: "The great steps of progress in science have come from the efforts of individuals. Schools and universities help forward knowledge by giving to many students opportunities to learn the present conditions, and from them some genius like Lagrange or Gauss may come forth to solve hard questions and to break the paths for future progress. This is about all the schools can do. We need a body of men who can give their lives to quiet and continuous study."

This need is not confined to any particular branch of science. The genius and acumen required for investigation find a no mean field for the exercise of their full faculties in the realm of applied and economic science. Special qualifications and training seem necessary to applying the results of investigation in pure science to practical everyday life. The high plane of this work and its value to mankind were well expressed in Dr. Jordan's address before the Society for the Promotion of Agricultural Science, which will be printed in the next number.

The advantages of institutions designed especially for research were emphasized by several of the speakers in this discussion; and this, it may be noted, is one of the greatest initial advantages of the agricultural experiment stations.

With reference to cooperation in research it was held, at least by one of the speakers, to be a mistake to strive too much after coordination. Cooperation, it was pointed out, often means subordination, which is usually stifling in its effects; and the best plan was thought to be for each institution to go on in its own way in research, rather independently, and work out its own plan, whether it lead to success or failure.

While it is not unusual to encounter this feeling, or something akin to it, among investigators, the growing complexity of science and the increase in specialization seem to make a certain amount of cooperation very desirable. This is especially the case in investigating problems in applied science. There is greater need than ever for a considerable number of men, representing different branches of science, to collaborate in their undertakings and thus to strengthen the work of both. Some of the most successful features of our experiment station work illustrate this quite forcibly. Nearly every experiment station furnishes some good examples. We have only to be reminded of some of these to see that cooperation within the station has not necessarily meant subordination. We have come to regard a union of two or more departments as extremely advantageous in many lines of station work, from the standpoint of the individual workers as well as that of the product as a whole. And one of the greatest services of the successful station directors has been to bring about a union of effort among members of the station staff, and to so coordinate and direct the work of different departments that the energies will not be scattered or the work too disconnected and fragmentary.

The name of Pierre Paul Dehérain is familiar to all readers of this journal. For years he has been one of the leading spirits in agricultural investigation in France, and is widely known through his writings and his works. His death occurred in Paris December 7, 1902, at the age of seventy-two.

Dehérain's earlier years were occupied in teaching chemistry in the Central School of Agriculture, and in 1865 he was appointed professor of chemistry in the Agricultural School at Grignon. In 1881 he was made titular professor of vegetable physiology in the Museum of Natural History at Paris, an honor which he highly prized, and in 1887 he was elected a member of the French Academy of Science in the vacancy caused by the death of the famous Boussingault.

During his long connection with the National School of Agriculture at Grignon and the station at that place, of which he was director, his time was devoted principally to investigation of problems in plant nutrition and growth, the culture of various special crops, the fermentation of manure, and soil problems. In the latter connection his studies on nitrification, the loss of nitrogen from the soil, and the value of cover crops as an aid to improvement, were conspicuous. In 1875 he established his *Annales agronomiques*, which he continued to edit until the close of his life. His publications in this journal and his *Cours de chimie agricole* (1872), *Traite de chimie agricole* (1892, recently revised), and *Les engrais, les ferments de la terre* (1895), may be mentioned as among his most important writings on agricultural chemistry.

Although Dehérain's name is not associated with any great discovery, he made very important contributions to the methods of investigation, notably in pot and plat work, and to the problems of plant nutrition and of nitrification. His work was conducted with such care and so thoroughly weighed and digested before publication that it inspired a high degree of confidence. His name will occupy a high place in the annals of agricultural chemistry and plant physiology.

AGRICULTURAL SCIENCE AT THE AMERICAN ASSOCIATION MEETING.

Although the American Association for the Advancement of Science contains no section for agriculture or agricultural science, it is doubtful if any other organization contributes so large a number of papers bearing directly and indirectly on that subject. The meeting in Washington during convocation week was especially rich in this respect. It brought together over 1,350 scientific men who are members of the association or some of its numerous affiliated societies, among them many who are active workers in the special fields of agriculture. It furnished the occasion for presenting the latest progress in the sciences on which agriculture is based, and held much of interest to every agricultural investigator.

This fact emphasizes the intimate relation of the work of the experiment stations to the work of this great association as a whole, and to the progress of science in general. From present indications the winter meetings of the American Association and its affiliated societies may be regarded as a scientific center for the presentation of technical papers in agricultural science, and as such of the greatest importance to the experiment station worker. The scope of the association is sufficiently broad to take in all lines of agricultural investigation; and the inspiration gathered from coming in contact with so large a body of men whose lives and interests are allied with the advancement of science in various directions, is far reaching and can not fail to be most helpful. This is especially true now that the economic and applied phases of science form so conspicuous a feature of the meetings.

It has been thought a matter of interest to bring together, as far as possible, those papers which related quite directly to agricultural science. No such grouping is otherwise provided for, and as they are so widely scattered through the proceedings of at least twelve different sections and societies many of them are likely to be lost sight of. The selection of these papers from the scores which are of undoubted interest to agriculture in the broader sense is often somewhat embarrassing, but the scope of this journal has been taken as a general guide. The aim has been to group the papers by subjects, regardless of the section or society before which they were presented. No attempt is made to give a complete report for any of these bodies, as that is done through other agencies.

AGRICULTURAL CHEMISTRY.

A liberal proportion of the papers presented before the section of chemistry of the American Association and the American Chemical Society, which held joint meetings, were in the field of agricultural chemistry or had a quite direct bearing on agricultural investigation.

The address of the vice-president of the section of chemistry, H. A. Weber, was on the subject of Incomplete Observation. In this he reviewed in a general way the changes in our theories on a number of subjects, and gave especial attention to the investigation of the assimilation of nitrogen by plants. Beginning with the work of Boussingault, which for a long time was the basis of the belief that plants could not assimilate nitrogen, he traced the attempt to overthrow this theory, closing with the classic investigations of Hellriegel, which established beyond further doubt the ability of legumes to draw nitrogen from the air. From the conflicting evidence of investigations on this important topic during a period of more than forty years, the speaker drew some deductions as to the danger of inaccurate and incomplete observation, and the way in which this may temporarily hinder the progress of science.

H. W. Wiley described the nature of the work of the Bureau of Chemistry of this Department, and explained the present organization of the Bureau. There are now 8 laboratories, each with a quite well-defined field of work, i. e., foods, sugar, dairy products, fertilizers, soil analysis, road materials, insecticides and agricultural waters, and dendro-chemical studies. Some special features of the work of each of these laboratories were briefly reported, and mention was made of some of the more comprehensive undertakings of the Bureau, such as the study of the effect of environment on the chemical composition of crops, notably the sugar beet and the gluten content of wheat; the comparative study carried on with the experiment stations on the fertilizer requirements of plants, and the means of determining these by chemical analysis; and the investigation of the effect of food preservatives on the metabolism and digestive functions, which is now in progress.

E. A. de Schweinitz described the work of the biochemic laboratory in the Bureau of Animal Industry. He explained that biochemistry has now become recognized as a quite distinct branch of chemical science, a number of professorships having been established, and a journal for biochemistry inaugurated in Europe. In a general way the biochemic laboratory studies the character and properties of toxic and nontoxic substances produced by bacteria within and without the body, and the relation of these substances to disease and its prevention. Dr. de Schweinitz described the biochemic work on tuberculosis, which has had for its aim a study of the relation of the germs from man and from animals in their growth on artificial media, determining the production of fat, ash, and phosphoric acid by them. This has been an aid in showing the intimate relation of tubercle bacilli from human and bovine subjects, and has led to the improvement of media for the isolation of tubercle bacilli in animal tissue. It has been found that a good tuberculin can be prepared from nondisease-producing bacilli attenuated by growth on acid media. Reference was made to the work with mallein for use in detecting and treating glanders; a study of the effect of germicides on enzyms, and also of the products of bacterial growth; and the more recent studies which have been undertaken on dairy bacteria and the effect of their products on dairy products.

In a paper on The Chemical Work of the Bureau of Soils F. K. Cameron referred briefly to the various lines of work of the laboratory of soil chemistry of that Bureau. He mentioned especially that relating to the devising of methods of examining soils in the laboratory and in the field, and studies of soil solutions with reference to formation and distribution of alkali salts and to plant nutrition. Work of this character has been noted from publications of the Bureau (E. S. R., 13, pp. 428, 918, 927).

A paper on The Composition of Fresh and Canned Pineapples, by L. S. Munson and L. M. Tolman, reported data which have been gathered with a view to determining whether the fruit has been preserved with or without the addition of cane sugar. Thirty-two samples of fresh pineapples from Florida, Cuba, Bahamas, and Porto Rico ranged in total solids from 10.78 to 18.86 and averaged 14.17 per cent, and in total sugars from 7.88 to 14.74 and averaged 11.50 per cent. Ten samples of canned pineapples from Singapore, put up in their natural juice without the addition of cane sugar, averaged 13.39 per cent of total solids and 11.56 per cent of sugar, while 6 samples from the same source, canned with the addition of cane sugar, averaged 18.17 per cent of total solids and 16.78 per cent of sugar. The averages of 31 samples of canned pineapples from appraisers' stores, New York City, obtained from Singapore and Straits Settlements, were 21.04 per cent of solids and 17.67 per cent of sugar, and of 11 samples from the Bahamas 14.13 and 10.73 per cent, respectively. The same authors, with E. M. Chace, reported upon The Chemical Composition of Some Tropical Fruits and Fruit Products. The fruits analyzed were gathered in Cuba. They included oranges, grape fruit, limes, bananas, tamarinds, guavas, mangoes, pineapples, sweet sop, sour sop, cherimoyer, nispero, mammee, hicaco, and maranon (cashew). Various preserves made from a number of these fruits were also described. Some deductions were drawn with reference to the high content of solids and sugar in these fruits, although the relation between the solids and sugar was said to be about the same as in northern grown fruits.

The Iodin Absorption of Oils, Comparison of Methods, was the title of a paper by L. M. Tolman and L. S. Munson. The objections to the Hübl method, as pointed out, are the liability of the solution to change with age affecting the result of titration, and the length of time employed, in which there is a considerable difference in the practice among analysts. Comparison was made of the Hübl, Wijs, and Hanus methods on butter, oleo, cocoanut, and a variety of other oils. The three methods were found comparative only on oils with low absorption, like butter and oleo. A special investigation of olive oils of known purity showed both the Wijs and Hanus methods to be satisfactory; but the authors have adopted the Hanus method, as the solution is simpler to prepare, and propose it as a substitute for the Hübl method, with which it agrees well on all oils except on drying oils.

A. H. Gill discussed the question of the occurrence of cholesterol in corn oil, which has been reported by Hoppe-Seyler and by C. G. Hopkins. The matter is of interest, as corn oil is one of the very few vegetable oils from which cholesterol has been reported. The speaker pronounced the melting point reported by Hopkins as too low for cholesterol, and the color reaction as unreliable. He prepared the substance and obtained about 0.22 per cent. This he identified as phytosterol, instead of cholesterol. The substance agrees with that obtained from wheat by others, and is thought beyond doubt to be phytosterol.

H. E. Alvord presented (before the Society for the Promotion of Agricultural Science) the results of determinations of the water content of 800 samples of butter from 400 creameries located in 18 States. The collection was considered representative of the creamery product of the United States. The butter was made during the period from May to September. The water content for the period covered varied from 7.20 to 17.62 per cent and averaged 11.78 per cent. Of the total number of samples seven-eighths showed between 10 and 14 per cent of water and over one-half between 11 and 13 per cent. The percentages for the different months were as follows: May, 11.81; June, 11.91; August, 11.79, and September, 11.59. It was pointed out that the water content can not be judged by appearance.

C. A. Crampton, of the Bureau of Internal Revenue, reported upon The Composition of Renovated or Process Butter. The speaker described the methods ordinarily practiced in making renovated butter, the origin of the stock, etc. The product does not vary much from ordinary butter in composition, as shown by analyses of samples collected officially from the principal manufacturers of renovated butter in the United States. The average was as follows: Water (by direct determination), 14.44 per cent; fat, 82.05; curd, 1.47, and ash, 2.85; Reichert-Meissl number 29.15, refractive index 1.4608, Crismer value 49.05, Valenta value 41.6, acidity 6.57, and iodin number 36.78. The usual tests applied for renovated butter are polarized light, boiling in open vessels, and the Waterhouse tests, but each of these tests failed in one or more cases on the above samples. A study was made of the changes in the fat during the manufacture of renovated butter to determine whether any change was produced in the oil which might serve as a means of detection. There was no decided change in the character of the fat after blowing or renovating. The greatest difference was found in the Reichert-Meissl value, but this was not regular. The speaker concluded that for the present physical tests must be relied upon for detecting renovated butter.

The same author also presented a paper on the Composition of Spirits Produced from Grain and the Changes Undergone by the Same when Stored in Wooden Packages, the work reported being a study which has been in progress for a number of years, with reference to the fixing of standards and the detection of added coloring matters.

In a paper on Solubility Curves for Magnesium Carbonate in Aqueous Solutions of Sodium Chlorid, Sodium Sulphate, and Sodium Carbonate, F. K. Cameron and Atherton Seidell reported a continuation of their studies of the theory of solution as applied to soils, especially the formation and transportation of alkali in soils (E. S. R., 13, p. 927). These have given valuable results in pointing out a satisfactory chemical classification of alkali, giving a clearer insight into alkali phenomena, and explaining the effects of certain methods of treatment of soils.

O. Schreiner described A Method for the Colorimetric Determination of Phosphates and Silicates when Both are Present, which he claimed is especially applicable to waters, soil solutions, and plant solutions. The method is based upon the comparison of the coloration produced when ammonium molybdate and nitric acid are added to unknown solutions containing phosphates and silicates, with that produced when standard solutions are so treated. The method of procedure consists in adding to one of two equal portions of the solution to be tested the ammonium molybdate and nitric acid simultaneously, to the other ammonium molybdate first and the nitric acid one-half hour afterwards. It is claimed that the coloration produced in the second case by the silicates which may be present is just about one half that produced in the first case. From this equations are derived which furnish a ready means of calculating the relative proportions of phosphates and silicates present.

In a paper by J. H. Long on The Relation of the Specific Gravity of Urine to the Solids Present, it was pointed out that the important thing in urine analysis is not the total solids but the solids of metabolism, i. e., the total solids less the salt, which can be easily determined by estimating the salt. The author gave the factor or coefficient which he has worked out.

A paper by A. S. Loevenhart on Some Observations on the Rennin Coagulation of Milk, which was presented before the American Physiological Society, may be mentioned here. It was explained that in the rennin coagulation of milk there is a stage when the milk may yield a heat coagulum before there is any apparent change in the consistency of the milk. The interval between this metacasein stage and the spontaneous coagulation varies inversely with the amount of rennin present; it may be so transient as to be imperceptible, or it may be indefinitely prolonged by any agency which partially fixes the calcium, as boiling, adding a little ammonium oxalate, etc. Large amounts of ammonium oxalate entirely prevent any heat coagulation at this stage, indicating that soluble calcium salts are necessary for the metacasein reaction. If the rennin be destroyed by heat at that stage, a coagulum will be produced by the addition of calcium chlorid, indicating that the caseinogen has been largely transformed into paracasein. Fresh milk can not precipitate paracasein solutions nor can it prevent the precipitation of paracasein by calcium chlorid. These facts led the author to conclude that the calcium salts in milk are altered in some way during the action of the rennin, and by virtue of this become capable of precipitating paracasein. It was suggested as most probable that the calcium salts of the milk are very loosely combined with some constituent of the milk, and that these compounds are dissociated during the action of the rennin.

BOTANY.

The botanical papers of agricultural interest were about equally divided between the section of botany of the Association, the Botanical Society of America, and the Society of Plant Morphology and Physiology. Isolated papers on botanical subjects were also read before other sections and societies and are here included. There were many others of general interest to botanists but not of sufficient direct bearing on agricultural science to be included in this review.

In his vice-presidential address before the section of botany, D. H. Campbell took the subject of the Origin of Terrestrial Plants. The various factors influencing the development of terrestrial plants were stated to be food, water, and various modifications of the reproductive plant organs. Of these factors the speaker held that water was one of the primary factors in determining whether a plant should be aquatic or terrestrial. The progressive development of plants from aquatic through amphibious to terrestrial habits was traced.

J. C. Arthur, retiring president of the Botanical Society of America, delivered an address on Problems in the Study of Plant Rusts.

He reviewed the present knowledge of rusts, paying particular attention to the work of Eriksson as well as of a number of investigators who have studied heterœcious rusts. The probable number of species of rusts which are more or less definitely known was estimated at one thousand or more. Among the grass rusts no species attacks species of grasses of more than one tribe. Doubt was expressed as to the accuracy of the mycoplasma theory of Eriksson. In conclusion the possible lines of cytological investigations with the Uredineæ were pointed out.

Before another section of the Association B. T. Galloway outlined the work of the Bureau of Plant Industry of this Department. Among the investigations in vegetable pathology only one was mentioned, that in selecting cotton resistant to the wilt, whereby the important sea-island cotton industry has been reestablished. Investigations in vegetable physiology were grouped under two heads: (1) Those relating to the food of plants, and (2) those relating to the improvement of plants. Under the first head mention was made of the efforts to increase the available nitrogen in the soil through the agency of nitrogen-collecting bacteria. The more general use of legumes has been promoted, and new legumes have been introduced, together with the micro-organisms necessary for their successful production. Among the investigations for the improvement of plants those mentioned as among the most important were in breeding and selection for special qualities, such as in wheat for immunity to rusts and other diseases, and in corn for increase of oil, starch, or nitrogen. The speaker also called attention to the trial shipments of fruit for the opening up of new markets and for the education of fruit growers in methods of shipping.

As was to be expected, the subject of plant breeding received much attention at the various meetings of the botanists, and it was evident that the matter was one of very live interest to a large contingent. The Society of Plant Morphology and Physiology had arranged for a discussion of Mendel's Law and its Bearings, to be led by L. H. Bailey and H. J. Webber. In this Professor Bailey took up the subject of mutations and variations, outlining de Vries's investigations and theories. Mutations were said to be fixed in their character from the time of their appearance, while variations are more or less progressive. Attention was called to the work of Mendel, which was highly complimented as being an important factor in putting aside the former idea that hybrids are largely due to chance, and showing that, to a certain extent at least, they are governed by certain fixed laws. The recent studies of Mendel, de Vries, Correns, and others were said to show most emphatically that in the studies of hybridism the old taxonomic idea of species must be abandoned. The practical benefit to be obtained from the recent investigations in hybridity, so far as the plant breeder is concerned, will lie along the improvement of methods of investigation.

Mr. Webber discussed the unit character as opposed to species character. In this he held practically to the same view expressed by Professor Bailey that taxonomic species were without value in the consideration of hybridity. The speaker was inclined to believe that the study of the chromosomes would not offer an explanation as to the phenomena of descent. He illustrated some of the modifications and confirmations of Mendel's law as shown in his experiments with corn, cotton, and other plants.

Discussing these papers W. H. Brewer called attention to the experiments in the breeding of animals, and William Saunders pointed out exceptions to Mendel's law in the case of crosses of raspberry, barberry, etc. Before the Society for the Promotion of Agricultural Science, Dr. Saunders outlined some results of experiments in cross-fertilization conducted at the Canada Experimental Farms. The object sought in cereals was early-ripening sorts which were productive and of good quality. Red Fife wheat was crossed with early-ripening sorts from Russia and India. In this way crosses have been secured which are from 4 to 10 days earlier, and satisfactory in other respects. In experiments in crossing apples, 14 sorts have been secured which are considered satisfactory enough to be grown for general use.

In a paper before the section of botany, H. J. Webber gave an account of experiments conducted by himself and W. T. Swingle on the crossing of citrus fruits. The ordinary sweet orange has been crossed with the hardy deciduous *Citrus trifoliata*, and during the past season a few specimens fruited. Among the hybrids 2 were described which are believed to possess some merit, the plants being more tolerant to frost than the ordinary sweet orange. The fruits, however, are smaller and decidedly inferior to the sweet orange, although a considerable improvement over the fruit of the hardy orange. They are thin skinned, juicy, and nearly seedless, but very sour, the flavor resembling that of the lemon more than the orange. The trees are reported to be evergreen or semievergreen, and capable of withstanding a temperature of 8° F. without appreciable injury. From the seed of these hybrids it is expected that some better varieties may be obtained. The fruits of a cross of the pomelo and tangerine were also described, the fruit being nearly intermediate in size and color between the two.

A paper by Hugo de Vries, on atavistic variations in *Œnothera cruciata*, was read by H. C. Cowles. The author gave the results of his experiments, describing various mutations. In Europe there seems to be a quite common variation of this American plant, and a number of other forms were mentioned which were attributed either to mutations or crosses.

Among other physiological papers was one by K. Goebel, on Regeneration in Plants, read by D. T. MacDougal. In this paper an account was given of the regeneration in Bryophyllum, Begonia, and other plants in which various phenomena were shown by the repeated removal of vegetative shoots from leaf buds, etc. In many instances seedlings were shown to have the power of reproducing parts that had been lost through various causes. The theoretical consideration of the causes was noted. In the discussion which followed, T. H. Morgan combated the hypothesis of Goebel that regeneration is due to the presence of "formative stuffs" and of polarity.

The Early Root Development of Tree Seedlings, an Important Factor in their Local Distribution, was the subject of a paper by J. W. Toumey. The correlation between the early root development and the local distribution of seedlings was shown by means of a series of lantern slides. The seeds of about 150 species of trees have been planted and the seedlings examined to determine whether the root systems exert an influence on the distribution of the species. Hickory produces a strong, persistent tap root, and these species persist on account of these tap roots seeking crevices in rocks and penetrating the soil deeply, so that they can flourish in poor, rocky soils. On the other hand, oaks do not have such a persistent tap root but soon develop secondary roots, and on this account oaks in general require a more moist soil than hickories. The tap root of the beech develops strongly for a time, but in the course of a year a broad system of lateral roots is developed, the tap root being checked in its further growth. Similar root systems are found in the maple and red ash, and these trees require a rich soil for their best growth. The sugar maple develops lateral roots quite early, and in general trees which develop strong lateral root systems in their early stages are not adapted to growth on sterile soils. Attention is called to the fact that in desert regions all the shrubby plants develop long tap roots.

A. D. Selby described etiolated seedlings of the alligator pear (*Persea gratissima*). The etiolated and normal plants were of about the same height, but structurally, as well as in color, considerable differences were noted. In the etiolated seedling the leaves were strongly modified and greatly reduced in size, and considerable differences in stem structure were also noted.

W. F. Ganong pointed out that while most persons interested in botany accept the statement that stamens and pistils are sexual organs, it is denied by some of the newer morphologists, who hold that sexuality is confined to the gametophyte within the embryo sack and the pollen grain. The author showed that the older terminology is correct, and that pistils and stamens should be viewed as sexual organs.

The isolation of a hitherto unknown pigment found in the leaves of *Sarracenia purpurea* by W. J. Gies was reported. The same author is said to have extracted a digestive fluid from the pitchers of *S. purpurea*, the ferment being an active digester of fibrin.

The rate of growth as affected by light and darkness was the subject of a paper by D. T. MacDougal, a very brief summary of which was presented. In substance the author reported that the average rate of growth is no less in the light than in darkness, nor does the average rate of elongation materially differ.

B. M. Duggar presented a paper on The Nutrition of Certain Edible Basidiomycetes, in which Brefeld's work was reviewed, as well as that published in Bulletin 16 of the Bureau of Plant Industry. The author has been successful in growing these fungi through several generations by the addition of basic salts, also when fragments of the fungus were added to the culture media. It was found in practice that bits of tissue instead of spores gave excellent results when grown in pure cultures. When the fungus is not an obligate parasite any basidiomycete may be grown in this way.

The same speaker described The Toxic Effects of Some Nutrient Salts on Certain Marine Algæ. The experiments on which this work is based were conducted at the Marine Zoological Laboratory, Naples, and at Woods Hole. Ordinary sea water is said to contain about 3.86 per cent of total salts. By varying the amount of the different salts it was possible to determine the toxic effect of different compounds. These were presented in gram-molecule solutions, and it is believed that the action is molecular rather than attributable to ions. The magnesium salts were found to be the least toxic of all, while the ammonium salts occupied a high position among the toxic elements.

The Decrease in Vitality of Grain by Age was the subject of a paper by William Saunders. Twelve samples of seeds grown in 1897 were stored in an office building at ordinary room temperatures, and subjected to germination tests each year from 1898 to 1902. The samples included 3 varieties of wheat, 3 of oats, 2 of barley, 2 of peas, and 1 of flax. The average percentages of germination for the five years were as follows: Wheat, 80, 82.3, 77.3, 37.3, and 15; oats, 90.2, 93, 78.2, 67, and 54; barley, 97, 91, 78.5, 36, and 19.5; peas, 94, 95, 88, 64, and 64; and flax, 81, 82, 75, 49, and 26. The results show that the seeds germinated as well the second year as the first, that a slight decrease in germination occurred during the third year, and a great decrease during the fourth year.

The Introduction of the Banana into Prehistoric America was discussed by O. F. Cook before the Anthropological Association.

H. C. Cowles traced the physical and ecological resemblances between the sand dune formations of Cape Cod and Lake Michigan. Certain peculiarities of the flora of each region were pointed out, the ocean side of Cape Cod not showing any zonal arrangement of plants. The conditions of Cape Cod are said to be less xerophytic than usually supposed. The number of plants on Cape Cod is said to be much more abundant than on the dunes of Lake Michigan, while about 75 per cent of the species were common to each region.

In this connection mention may be made of a paper, not altogether botanical, by A. S. Hitchcock on the work done in the fixation of sand dunes in Europe. The matter was presented before the Society for the Promotion of Agricultural Science, and was based on a recent personal examination. The countries visited were Holland, Denmark, Prussia, and France. In some places work along this line has been carried on for 100 years, but the more successful methods have been employed only during the last 30 years. The objects sought are the protection of the land back of the sand and the utilization of the sand itself. Various methods, such as the use of some dead cover, stakes, and artificial dunes, have been employed for holding the sand in place until the desirable forest covering can be secured. Close to the sea a forest covering can not be established and the growth of sand grass or beach grass is encouraged. It was stated that in the United States efforts along this line are being made only on Cape Cod and to a less extent near San Francisco. W. Saunders described briefly the work being carried on at Sable Island, in which favorable results have been obtained in the introduction of *Pinus maritima*.

Several papers on plant diseases of various kinds and the organisms causing them were presented before the botanical or other bodies.

W. A. Kellerman discussed various suggestions and experiments regarding uredinous infection. The author worked with 17 forms of rusts, making about 80 experiments. A number of new æcidial forms have been discovered and were mentioned. The author described a simple cheap cover, consisting of a frame of wire netting covered with cheese cloth, which is well adapted to experimental purposes until transpiration becomes too great. At this time a galvanized-iron frame carrying glass sides and top is to be substituted. The speaker urged extreme care in avoiding accidental infections. In working out of season in the greenhouse he recommended that both host plant and fungus should be similarly treated as to heat, moisture, etc., as preliminary to infection experiments.

Following this paper J. C. Arthur gave an account of his Cultures of Uredineæ in 1902. These were mostly made on heterœcious rusts of grasses and sedges. Three hundred and fourteen cultures were made, of which 23 collections failed to give any germination. More than 100 hosts were used, and the successes and failures were enumerated. The necessity of field investigations as a preliminary to infection experiments was pointed out, and it was suggested that when a rust is found in the field the collector should carefully examine and report upon all the plants growing within a radius of about 10 feet of the host carrying the rust, as this might furnish hints as to the possible alternate hosts of the species.

A paper by L. R. Jones and L. P. Sprague, entitled Plum Blight Caused by the Pear Blight Organism, was read by L. R. Jones. The blight was confined to young plum twigs from which the pear blight organism (*Bacillus amylovorus*) was isolated. The inoculation of green pears with portions of the diseased plum twigs was found a very satisfactory method of investigation. Organisms isolated from both the plum and pear were grown in a series of artificial cultures and found to behave alike in every respect. Typical cases of pear blight were produced by inoculation with the bacillus obtained from plum twigs. The typical plum blight, however, was not secured by inoculation. The organism was believed to gain access to the young twigs by way of the axillary buds. If allowed to develop unhindered in plums, it was suggested that the organism may acquire increased virulence toward this host.

E. F. Smith called attention to a bacterial disease of Japanese plums in which both leaves and fruit are affected. The organism was found to enter through the stomata existing on the fruit and leaves. The disease was first reported from Michigan, and although under investigation for a number of years, a single organism has always been found present. In one orchard the fruit of four-fifths of the Hale plums were affected, and a second variety, Wickson, was attacked to a less extent. The organism, entering through the stomata of the fruit, develops abundantly, breaking down the tissues and producing peculiar diseased areas, which were described at considerable length. On the leaves the organism causes a shot-hole effect, the dead portions falling out. This organism has been isolated and cultivated, and inoculation experiments prove it to be the cause of the disease. It is described as *Pseudomonas pruni*, n. sp. In a second paper the author offered proof that *P. stewarti* is the cause of the sweet corn disease occurring on Long Island. This disease may be first recognized from the character of the inflorescence, the male spikes giving the first indication of disease. These take on a peculiar white color, followed later by the wilting of the corn, which is said to characterize the disease. The author isolated and cultivated the organism, and by means of inoculation has secured characteristic symptoms of the disease in at least 75 per cent of his infections.

L. R. Jones gave the results of studies of cytohydrolytic enzyms produced by the soft rot bacteria, *Bacillus carotovorus*. The enzym was separated from the living organism by filtration, sterilizing by heating, by the use of phenol, thymol, or formalin, and by precipitation. Detailed studies were made with the enzym secured, and practically no diastatic action was observed.

W. A. Orton, in a paper read before Section G, described a disease of mulberry fruit which is reported from Georgia, Alabama, and Mississippi. Often as much as 50 per cent of the fruit is affected. The symptoms are peculiarly enlarged portions of the aggregated fruits. The disease is of fungus origin, and the point of attack seems to be the seeds, which are greatly enlarged. The fungus, which is closely allied to Glœosporium, was described as a new genus, Spermatomyces, the species name *mori* being given to it.

H. von Schrenk presented a paper on the production of wart-like intumescences as a result of spraying with various fungicides. In the greenhouses at the Missouri Botanic Gardens in St. Louis the cauliflower plants were attacked by *Peronospora parasitica* in an epidemic form. In order to protect the plants various fungicides were sprayed upon them and as a result the lower sides of the leaves became covered with large wart-like growths. These were formed by the elongation of the cells of the palisade parenchyma. This peculiar condition is supposed to have been caused by the stimulating action of the copper salts in the fungicides.

The same speaker discussed the cause of "blue timber." This is said to be a serious affection of various timbers, especially of pine, hemlock, and spruce, and is quite different from the green color sometimes noted in hard woods. There appears to be no deposition of crystals of coloring matter in this disease, and the color is attributed to the massing of the hyphæ of a fungus which is always present in the medullary rays of the blue wood. The fungus is said to fructify on wood cut from the tree, but not on the living tree.

A report was made before the section of botany by D. T. MacDougal on The Desert Laboratory of the Carnegie Institution. The board of trustees of the Carnegie Institution has granted $8,000 for the establishment and maintenance during 1902–3 of a desert botanical laboratory. F. V. Coville and D. T. MacDougal have been appointed by the board an advisory committee to have charge of the location and management of the laboratory. The proposed laboratory is designed for the thorough study of the physiological and morphological features of plants occurring in desert conditions, with particular reference to the relation of water, light, temperature, and other special factors to their development. In the discussion which followed the announcement of this grant a number of desirable localities were suggested as possible sites for the laboratory, the consensus of opinion favoring Tucson, Ariz., or that vicinity.

BACTERIOLOGY.

The Society of American Bacteriologists held three very full sessions, December 30 and 31, which were presided over by H. W. Conn. Nearly half the papers bore on agricultural bacteriology, and these included some of the most important read at the meeting.

In a paper on Oligonitrophilic Bacteria of the Soils, F. D. Chester explained that the oligonitrophilic bacteria are those which grow in nitrogen-free or nitrogen-poor media, and which possess the power of utilizing the free nitrogen of the air. Nitrogen assimilation in the soil is not the result of the activities of a single organism, but of symbiosis of microaerophiles (*Clostridium pasteurianum*, several species of Granulobacter of Beijerinck, and Radiobacter of Beijerinck) with macroaerophiles (Azotobacter of Beijerinck). Either of these forms alone is unable to assimilate nitrogen, but mixed cultures of Azotobacter with the other forms showed gain of nitrogen of 4 to 7 mg. per gram of assimilated sugar in the medium. A form of Azotobacter isolated from Delaware soil was without the power of assimilating atmospheric nitrogen.

W. M. Esten exhibited an electric thermo-regulator, previously described by H. E. Ward, for regulating the temperature in incubators heated by electric lamps within the oven. Two pieces of this apparatus have been made, which have proved very satisfactory and efficient in maintaining the incubators at a constant temperature when they were being run at a higher temperature than the surrounding air. The apparatus was highly commended on account of its simplicity, reliability, and safety from fire.

The same author described the preparation of a number of culture media for determining the kind of bacteria in milk on the plate culture. A gelatin containing milk from which the casein has been removed, designated the custard-whey gelatin, was said to bring out the differences more prominently than a peptone-litmus gelatin, and to inhibit the growth of liquefying bacteria. By means of this custard-whey gelatin it is quite possible to tell the age of the milk by the appearance of the growth in the plate culture.

A paper entitled Milk Agar as a Medium for Demonstration of Proteolytic Enzyms, by E. G. Hastings, was presented by H. L. Russell. The culture medium was prepared by the addition of 10 to 12 per cent of skim milk to agar, and was found very satisfactory for showing the presence of digesting bacteria in dairy products. The medium was readily cleared up by the growth of such bacteria.

W. A. Stocking, jr., presented a paper on The Germicidal Action of Milk, in which he reviewed the claims that milk soon after it is drawn has a temporary inhibiting action on bacteria, as judged from the number of bacteria in the milk, and presented data in opposition to this belief which tended to show that no true germicidal action exists. It was found that in nearly all experiments the total number of bacteria during the first few hours decreased, but a study of the different forms present showed that while the non-acid species decreased the acid species increased regularly from the first. One case was mentioned in which alkaline species were present and inhibited or retarded the growth of the lactic organisms. The acid species were mostly the true lactic acid organisms. There seem to be only two or three types of acid organisms which persist, 99 per cent in most cases being lactic acid organisms, the liquefiers and alkaline and other species, and most of the acid species not lactic, being crowded out.

Further Evidence of the Apparent Identity of *Bacillus coli* and Certain Lactic Acid Bacilli was presented by S. C. Prescott. The author prepared a series of cultures of bacteria corresponding to lactic acid bacteria isolated from grains and dairy products, and another series of cultures of bacteria corresponding to the coli bacillus isolated from fecal matter and from sewage polluted water. The two series were compared as regards cultural reactions, morphological characters, fermentative power, and pathogenic properties, and were found to be practically identical in these respects. The bacteria from both sources were shown to be somewhat pathogenic to guinea pigs. The general conclusion was drawn that the two classes of bacteria studied were actually identical. Bacteria corresponding to *Bacillus coli* are not confined to the intestinal tract. The mere presence of such bacteria in water does not, therefore, necessarily prove sewage pollution. Their presence in large quantities would be more indicative of such condition.

L. A. Rogers reported the isolation of a fat-splitting torula yeast from several samples of canned butter. The cells are elliptical, about 3.5 μ long and show little tendency to form chains or bunches. The torula shows a much weaker action than that of fat-splitting molds. The acid number of a pure butter fat inoculated with a milk culture of the torula increased in 2 weeks from 0.579 to 3.474. It ferments maltose slowly at 37° C., but does not ferment lactose, galactose, levulose, mannose, or sucrose.

A Preliminary Chemical Study of Various Tubercle Bacilli was reported by E. A. de Schweinitz. Analyses of tubercle bacilli, mentioned elsewhere, were reported, and the relation of human and bovine tuberculosis was discussed. Investigations were reported which led the speaker to the opinion that the two diseases are due to the same organism. Tuberculosis was produced experimentally in a calf by inoculation with a culture of the tubercle bacilli from the organs of a child which died of the disease, and the bacillus isolated from the organs of the calf resembled the bovine more than the human form. Experiments with monkeys showed them to be very susceptible to the bovine tubercle bacillus.

A paper by M. Dorset on Egg Medium for the Cultivation of Tubercle Bacilli was presented in substance by E. A. de Schweinitz. This medium is easily prepared from fresh eggs. The tubercle bacillus grows very readily upon it, colonies appearing in 6 to 7 days after inoculation. (See p. 611.)

Other papers of rather less interest in this connection were: Contribution to the Study of Agglutinins, by W. W. Ford; The Reaction of

Certain Water Bacteria with Dysentery Immune Serum, by D. H. Bergey; Germicidal Properties of Glycerin in Relation to Vaccine Virus, by M. J. Rosenau; and The Bacterial Flora of the Oyster's Intestine, by C. A. Fuller, which showed a flora characteristic for the oyster.

ECONOMIC ENTOMOLOGY.

The papers on economic entomology were all presented before the Association of Economic Entomologists, which met December 26 and 27, or the Society for the Promotion of Agricultural Science. Several of these papers were also read at the zoological meetings.

Before the Association of Economic Entomologists the address of the retiring president, E. P. Felt, was on the subject of The Literature of American Economic Entomology. Notes were given on the extent and value of the various kinds of entomological publications, including bulletins, reports, journals, books, indexes, and more pretentious forms of literature, as well as newspaper articles. The greatest amount of literature has been written on the subject of the Rocky Mountain locust, followed by the San José scale, gypsy moth, chinch bug, cotton worm and bollworm, codling moth, Hessian fly, and periodical cicada, in the order named.

C. L. Marlatt gave an illustrated talk on the economic entomology of Japan. This included an account of the author's itinerary in his recent studies in Japan, with notes on the entomological work and literature in Japan, the institutions and laboratories for studying entomology in that country, and special notes on their work on the insects of rice, deciduous fruits, citrus fruits, tea, lotus, bamboo, etc., and on the silk industry.

E. P. Felt reported observations on the Grapevine Root Worm, an extensive outbreak of which occurred in Chautauqua County during the past season. Oviposition occurred about 7 days after the appearance of the adult beetles. The eggs were deposited from July 3 to August 19. The period of oviposition was about 3 days and the eggs were laid in clusters of 5 to 75. Each female laid about 100 eggs. The larvæ were found to travel 2 or more yards per hour and were able to make their way through 12 in. of soil in a comparatively short time. Cultivation of the soil was apparently effective against the pupæ. A modified curculio catcher was used with good results in catching the beetles. The insects were also destroyed by spraying with arsenate of lead in the laboratory, but in the field this insecticide gave negative results.

Dr. Felt also reported upon Results Obtained with Certain Insecticides. It was found that a 20 per cent mechanical mixture of crude petroleum applied April 7, when followed by an excessively rainy period, destroyed nearly all the scales without injuring the trees. Pear and peach trees were sprayed with crude oil in various forms without injury except when it was undiluted, and good results were also obtained on plums. No injury was produced from a 20 per cent mixture applied in July. Whale-oil soap also gave good results in destroying the San José scale when applied at the rate of 1¼ lbs. per gallon of water. Lime, sulphur, and salt was applied April 7 to about 60 trees, but the period following was very rainy and it appeared to have but little value. Orchardists in the same neighborhood, however, had excellent results from this insecticide.

A. L. Quaintance gave Further Notes on the Lime, Sulphur, and Salt Wash in Maryland. The author's previous report that this treatment was ineffective was reversed by later observations. The effectiveness of the insecticide persisted for several months.

The lime-sulphur-salt mixture was also discussed by W. E. Britton. Pear, peach, quince, and plum trees in Connecticut were sprayed with this mixture in April. In June the percentage of living scales varied from zero to 7 per cent. The mixture was as effective as any other insecticide, and was used by orchardists on large orchards with good results. During a prolonged discussion of this subject, participated in by various members, C. L. Marlatt stated his belief that at present the best remedies for San José scale are the lime-sulphur-salt mixture, pure kerosene, and kerosene emulsion.

C. B. Simpson reported Observations on the Life History of the Codling Moth, illustrated by lantern slides. In the author's experiments it was found that $\frac{1}{5}$ to $\frac{1}{4}$ of the eggs were laid on the fruit, while most of the eggs were laid on the leaf; the larvæ may come to maturity in the leaves without the presence of apples. About 80 per cent of the first generation of larvæ were found to enter at the calyx, and 28 per cent of the second generation. The average length of life of the moth was found to be 4 days. It is believed that there are 2 generations per year. A period of 50 days was noted between the maximum appearances of larvæ. With regard to the broods of this moth, it is stated that there are probably 1 in Canada, New Jersey, and parts of Idaho, 2 in Oregon and the Upper Austral Zone in general, and 3 in the Lower Austral Zone.

In a note on A Criticism upon Certain Codling Moth Investigations, F. L. Washburn gave special attention to a criticism by Cordley and Gillette of his work in Oregon. The author believes that the number of broods of the codling moth in western Oregon is still in doubt. The same author read a paper on the Distribution of the Chinch Bug in Minnesota, showing that during the past season it was confined to the southern parts of the State. This limited distribution it is believed is determined partly by the methods of farming employed in different parts of the State.

J. Fletcher discussed the question Can the Pea Weevil be Exterminated? It was argued that, since the pea weevil has no other food plant than the common pea, it could probably be exterminated by interrupting the cultivation of the peas for 1 or 2 years, or by thoroughly fumigating the seed peas. The great practical difficulties with either one of these plans were carefully discussed. The author recommends harvesting the peas a little earlier in the fall, and immediately thrashing and sacking the peas so as to prevent the escape of the beetles in the fall, and the treatment of all seed peas with bisulphid of carbon.

W. B. Alwood presented notes on Plants Injured by 17-year Locusts. It was stated that the locust did not deposit eggs in an orchard which was previously sprayed with Bordeaux mixture. The eggs were deposited in a considerable variety of plants, including 14 families, 30 genera, and 33 species.

V. L. Kellogg gave brief notes on observations made on Aleurodidæ and Coccidæ. A number of new species and new host plants were discovered for these insects, and investigations were made extending throughout the Sierra Nevada Mountains. The Monterey pine on the grounds of Stanford University were badly attacked by the bark beetles, and a tar-canvass jacket was adjusted to the trees for the purpose of conducting some fumigation experiments. It was found that hydrocyanic-acid gas destroyed the insects in all stages, while carbon bisulphid was of little value in this respect.

A. F. Burgess read a paper on Economic Notes on Coccinellidæ. Statistical data were presented, including the number of eggs laid by various species of ladybirds, the period occupied by the different stages of development, and the number of plant lice eaten by the ladybirds during their various stages.

In a paper on *Melanoplus femoratus*, J. L. Phillips stated that this insect caused serious damage in Virginia to pasture and meadow grasses, wheat, and the foliage of apple trees.

The position of the setæ of San José scale in the tissues of imported plants was discussed by G. B. Symonds. It was found that the beak of the San José scale is inserted in a straight line in fruits, through the cell bodies and not between the cells in the cell membranes. In wood, the beak is bent at a right angle just beneath the surface of the bark.

H. Osborn discussed a method for mounting dried Coccidæ for permanent preservation. Specimens were mounted between strips of mica of the size of microscopic slides. They were thus protected against breaking, moisture, and museum pests.

Papers on the insects of the year and minor entomological notes were presented by E. P. Felt, of New York; J. Fletcher, of Canada; H. Osborn, of Ohio; A. L. Quaintance, of Maryland, and C. M. Weed, of New Hampshire, some of which brought out discussions in regard to particular insects. J. Fletcher stated that in Manitoba hopper-dozers were largely abandoned in the fight against grasshoppers, for more effective poisoned baits, which consist of a mixture of bran or horse manure and Paris green. In the experiments reported by the author horse manure was found to be the more effective. The bait was prepared so as to contain 1 lb. of Paris green and 1 lb. of salt to 50 lbs. of horse manure.

In a paper on Plant Environment and Insect Depredations, F. W. Rane called attention to the value of proper cultural methods, which may be so practiced as to reduce insect ravages to a minimum. The necessity of devising practical remedies available to ordinary farmers and fruit growers was emphasized.

The three following papers were presented before the Society for the Promotion of Agricultural Science. The Importance of Injurious Insects Introduced from Abroad, by E. P. Felt, discussed the introduction and distribution of the more important insects, gave estimates of the extent of the damage done by a number of them, and presented a classified list of the important species. Notes were also given on a number of beneficial species which have been introduced.

H. Osborn discussed insect problems in Ohio, giving notes on a number of injurious insects and estimates of the damage done by them. The total loss of farm and vegetable crops due to insects was placed at 10 per cent. Some of the insects receiving especial attention were the Hessian fly, San José scale, cankerworm, and the codling moth. In the discussion of this paper it was stated that some varieties of wheat were found more resistant to the Hessian fly than others, but that it was not always practical to grow the more resistant varieties. Decoy crops were also mentioned as successful when properly attended to. The use of lime-sulphur-and-salt wash against the San José scale in New York was reported by W. H. Jordan as very successful in experiments conducted during one season.

A paper by F. M. Webster, entitled The Use of Arsenate of Lead Against the Codling Moth, was read by title. Experiments on the use of arsenate of lead were conducted by the author in 1901, with results which were considered encouraging. In 1902 practical tests were made by a number of fruit growers in Ohio and Indiana, the results on the whole being considered favorable to the use of this insecticide. In one instance the percentage of wormy apples from sprayed trees was 3.6 and from unsprayed 79.5; in another instance 1.4 and 54, respectively; and in a third experiment 6.9 and 69, respectively.

Before another body L. O. Howard spoke briefly regarding efforts of the Division of Entomology to lessen the damage that insects are doing to agricultural interests, which is estimated at $300,000,000 per annum, and for the control of which the Government spends only $150,000 per annum. For the purpose of classifying the work insects are divided into groups, e. g., those affecting field crops, orchard fruits, truck crops, sugar beets, etc.; those concerned in silk production, and those injurious to mankind by carrying diseases. A study of the life history of these insects is made for the purpose of revealing their most vulnerable points, and then attacks upon them are made at those points. This method has enabled the Division of Entomology among other things, to check the ravages of the cotton-boll weevil by cultural methods, and to point out ways of lessening the ravages of the codling moth in the Northwest. The Division has also introduced into this country a number of beneficial insects, such as the ladybird beetle from Australia, which has saved the orange crop of California, and the insect from Algeria which fertilizes the Smyrna fig and makes it possible to successfully grow this fruit in California.

PHYSIOLOGY.

A number of papers of especial interest to students of nutrition were presented at the meetings of the American Physiological Society. Among these the following may be mentioned: New Experiments on the Physiological Action of the Proteoses, by L. B. Mendel and F. B. Underhill; Further Observations of the Movements of the Stomach and Intestines (with demonstration), by W. B. Cannon; Salivary Digestion in the Stomach, by W. B. Cannon and H. F. Day; Biological Relationship of Proteids and Proteid Assimilation, by P. A. Levene and L. B. Stookey; On Digestion of Gelatin, by P. A. Levene and L. B. Stookey; On the Nucleoproteids of the Pancreas and Thymus, with Special Reference to their Optical Properties, by A. Gamgee and W. Jones. Professor W. O. Atwater read a paper on the Sources of Muscular Energy, in which the results of his experiments with the respiration calorimeter were quoted with especial reference to the value of different materials as sources of energy in the animal body.

ENGINEERING.

A paper on Agricultural Engineering, by Elwood Mead, noted the revolution in the conditions of farm life and farm labor in the last fifty years. These have necessitated greater attention on the part of the farmer to problems in agricultural engineering, the substitution of power for hand labor, and the use of more effective implements and machines. A number of the agricultural colleges of this country have turned their attention to this matter, incorporating in their courses of instruction a study of the principles on which efficient machines rest; and in European countries institutions have been established for the study and improvement of farm machinery, which are supported by the State. The lack of classified and verified information was mentioned; and the desirability of efforts in this direction by the National Department of Agriculture was pointed out.

C. G. Elliott described The Drainage Problems of Irrigation, a new series of problems which confront the owners of irrigated lands. The leakage from canals and overirrigation have destroyed the productiveness of land by producing saturation of soils in certain localities and resulting alkali conditions. Well-directed drainage operations, it was believed, will reclaim such lands and protect those which are threatened with the evil.

The Hydrographic Work of the U. S. Geological Survey was described by H. H. Presley, who reviewed the work on the measurement of streams and the relation of this to problems in irrigation.

The Road Material Laboratory of the Bureau of Chemistry of this Department was the subject of a paper by L. W. Page. He mentioned the different road-making materials and pointed out the wisdom of having them tested by laboratory methods before they are used in construction. Differences in the amount and character of traffic may determine the kind of material that is required. The binding materials present with crushed rocks of various kinds were said to have much to do with the value of these materials for surfacing roads.

The Cementing Power of Road Materials was presented by A. S. Cushman. The cementing value is a phenomenon of the same nature as the plasticity of clays, and results in the road-material laboratory of this Department seem to point to the fact that plasticity is dependent on a colloidal condition of the particles. Surfaces of roads are continually being powdered by the effect of traffic wear and weathering, and the particles are continually being cemented and recemented. If the material of the road lacks plasticity the particles blow and wash away too readily. The binding quality of such rocks as limestones and dolomites is a function of the hydrogel impurities, present usually either in the form of silicic acid or hydrated oxid of iron.

In a paper on The Metric System, J. Burkitt Webb opposed the introduction of this system from the standpoint of engineering. Standards of length lie at the foundation of all our important and accurate manufacturing and engineering work, and an examination of the necessities of this work, in both its theoretical and practical parts, was stated to show that a change to the metrical system would be not only very expensive but detrimental. He argued that 16 (the subdivisions of the inch) is in many ways a better number than 10 as the basis of a system; and he attempted to point out some of the peculiar collateral advantages of 16.

AGRICULTURE AND ECONOMIC SCIENCE.

Most of the papers presented at the meetings of the Society for the Promotion of Agricultural Science have been noted elsewhere under appropriate headings. The presidential address, delivered by W. H. Jordan, on Values in Science, will appear in the next issue of this journal.

A report was received from the committee acting in cooperation with a committee of the Association of American Agricultural Colleges and Experiment Stations, for the purpose of requesting the board of trustees of the Carnegie Institution to apply some portion of the Carnegie gift to the promotion of scientific research in its relation to agriculture. In the memorial presented to the board of trustees certain general lines were suggested as suitable for research work. The communication was considered at a meeting of the board of trustees and returned to the committee with a request for concrete suggestions rather than generalizations. The committee was continued with a view to making such suggestions.

W. J. Beal discussed briefly courses of study in agricultural colleges, mentioning some of the features of instruction in agriculture in early years, and expressing the opinion that allied groups of subjects should be elective by students soon after entering college. This brought out a spirited discussion upon entrance requirements and agricultural education in general.

The same speaker presented some biographical notes on the late Robert C. Kedzie, who was a member of the society.

A paper on The Diameter of Wool Fibers from Different Breeds of Sheep of the United States and Canada, by T. F. Hunt, was read by title. Measurements of the wool from 1 to 5 sheep of 13 breeds were made by Lamotte Ruhlen, and showed a range in the diameter of the fibers from 4.28 to 1.8 centimillimeters, the extremes being represented by the Leicester and the American Merino breeds.

B. E. Fernow presented a paper on The Farmers' Wood Lot, in which the importance of looking after the wood supply more carefully was emphasized. Estimates were given of the increased consumption of wood products in the United States and foreign countries. The export trade of the United States was stated as having doubled during the last 10 years. At the present rate of consumption the timber supply of the United States in view will, according to the author, be exhausted within 30 years. As 60 to 100 years are required for the production of millable timber, and for other reasons, it was shown that few farmers can engage in this business. For the production of wood for fuel purposes, however, the time required is only 20 to 30 years, and waste lands may be utilized for this purpose.

Before the section of Social and Economic Science a paper on Requisites in Crop Reporting was read by H. Parker Willis, which dwelt at some length on the purpose and importance of crop reports, and the reasons for lack of confidence in such reports as now prepared. The requisites pointed out were in brief (1) perfect confidence in the man in charge of the reports, his office force, and his correspondents; (2) publicity as to methods of operating; (3) dealing with facts rather than estimates, and (4) the uniting of all Government statistical agencies under one management.

The Sources and Margin of Error in Census Work was the subject of a paper by Le Grand Powers, Chief Statistician for Agriculture, U. S. Census. This dealt mostly with errors in the census of agriculture, the principal sources of which were said to be omissions and duplications on the part of census enumerators. In most branches of census work omissions and duplications nearly balance, but in the census of agriculture, comparisons with the records of assessed land show that the omissions exceed the duplications, the excess amounting in farm areas to 40,000,000 acres, or 5 per cent. The omissions are most numerous in sparsely settled regions where there is much irregular land surface; the duplications, in thickly settled communities, especially where tenant farming prevails and both tenant and proprietor report on the same items.

Discussing the Economic Value of the Remaining Public Lands, J. D. Whelpley pointed out the extent and conditions of these lands and offered some suggestions regarding their management, the most important of which was that speculation in them should be stopped by limiting their disposition to those only who intend to build homes on them.

The Social Aspects of the Irrigation Problem were presented in a paper by Guy E. Mitchell.

Miss Louise Klein Miller, Director of the Lowthorpe School of Horticulture and Landscape Gardening for Women, discussed School Gardens, pointing out the function of the school garden as an agency for promoting logical instruction in nature study and elementary agriculture. A brief account was given of the school garden movement in Europe and America, followed by a more detailed account of Miss Miller's own work at Groton, Mass.

NATIONAL DEPARTMENT OF AGRICULTURE.

The organization and the scientific and economic work of this Department were presented by a number of the chiefs of bureaus at various meetings of the association during the week.

The work of the Weather Bureau, as described by Willis L. Moore, is the broadest survey of the kind ever made, with an extent north and south of 3,000 miles and east and west an equal distance. The practical workings of the Bureau were mentioned, and some striking evidences of the value of its predictions on land and sea were cited.

The economic work of the Bureau of Soils was outlined by Milton Whitney. Maps were exhibited to illustrate the location and extent of the soil surveys made by the Bureau during the past four years, and brief reference was made to some of the results of economic importance. Special mention was made of the Sumatra tobacco industry in the Connecticut Valley, and the recent discovery of a soil in Texas said to produce tobacco with the peculiar aroma of the Cuban product. In the Yazoo Valley of Mississippi a way has been pointed out whereby thousands of acres of flooded bottom land can be reclaimed for cotton growing. In the West the officers of the Bureau have satisfied themselves that much of the 6,000,000 acres of alkali soil can be made productive by proper methods of drainage, and they are attempting to demonstrate their theory to the people in the alkali regions.

A. C. True, speaking of the Office of Experiment Stations, considered it first, in relation to the agricultural colleges and experiment stations, as a general agency for the promotion of agricultural education and research. On the economic side these institutions are doing much to increase the amount of production and to raise its quality through the application of science to agriculture. On the social or educational side they not only provide much material for effective courses of study in the theory and art of agriculture, but also furnish the motive for definite technical education in agriculture; and this is changing the intellectual attitude of the farmer from conservatism to progressiveness, broadening and deepening his intellectual life—a service as important, to say the least, as improving his material condition. Some of the leading lines of work of the Office were mentioned, such as the publication of this journal and numerous technical and popular bulletins, the formulation of the principles on which institutions for agricultural research should be organized and managed, the promotion of technical education for the farmer, by encouraging the formulation of a distinct science of agriculture and its reduction to "pedagogic form" to meet the requirements of different grades of students, the organization and management of agricultural experiment stations in Alaska, Hawaii, and Porto Rico, and the investigation of problems in the nutrition of man and in irrigation, in cooperation with other scientific organizations.

Descriptions of the work in several other bureaus and divisions have been noted elsewhere.

The meetings afforded opportunity for the visitors to inspect the laboratories of the Department, which was embraced by many. This, with the discussions of the work of the various branches in general and of special lines of work in the different section meetings, conveyed to many a much clearer idea of the objects, scope, equipment, and workings of the Department in various lines.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Proceedings of the seventeenth convention of the Association of Agricultural Experiment Stations in the German Empire (*Landw. Vers. Stat., 57 (1902), No. 1–2, pp. 1–101*).—The seventeenth meeting of this association was held at Hamburg September 21 and 22, 1901, and was presided over by the president, F. Nobbe.

Among the subjects under consideration were the determination of citrate-soluble phosphoric acid in Thomas slag, the Neubauer method of potash determination, the Gunning modification of the Kjeldahl method of nitrogen determination, the allowable water content of molasses feeds, and their analysis, the determination of potash salts in mixed potash fertilizers, fundamental principles in the examination of bran, the relation of the agricultural experiment stations to the work of the association, the preparation of feeding stuffs for analysis, with directions for sampling, the changes produced by micro-organisms in foods and feeding stuffs during storage (E. S. R., 13, p. 581), the microscopical examination of rape-seed cake, the money value of feeding stuffs, and the present status of the movement for the introduction of uniform atomic weights.

An unfavorable report upon the accuracy of the Neubauer method was made by Soxhlet and no action was taken by the association. Comparative tests of the Gunning modification of the Kjeldahl method (E. S. R., 14, p. 118) and the method of the association on different feeding stuffs were reported by Kellner. Further testing of the Gunning modification was recommended. A water content of 20 per cent in molasses feed and 25 per cent in peat molasses was adopted as allowable. The determination of molasses in molasses feeds was assigned for further study. The recommendation was adopted that potash in fertilizers be reported only as K_2O. Wittmack discussed the purity of bran and its determination, and reported several feeding experiments with different animals. It was recommended that all feeding stuffs for analysis should be prepared fine enongh to pass through a 1-mm. sieve. Emmerling discussed the microscopical examination of rape-seed cake. A committee of three was appointed to determine the relative value of nutrients—protein, fat, and carbohydrates—in feeding stuffs and report annually to the association.

The action of distilled water upon lead, F. Clowes (*Chem. News, 86 (1902), No. 2236, p. 168*).—The author found that when lead was placed in contact with ordinary distilled water a white deposit was formed which contained lead and a certain amount of lead went into solution in the water. The lead in solution appeared to be in the form of hydroxid. That in the white deposit was found to be a hydroxycarbonate containing three molecules of carbonate to one of hydroxid. Investigations in which bright sheet lead of great purity was exposed to the action of boiled distilled water *in vacuo* or in different gases showed "that dissolved oxygen is the cause of the action of distilled water upon lead, the subsequent action of carbonic acid leading to the production of hydroxycarbonate."

The determination of iron in natural waters, L. W. Winkler (*Ztschr. Analyt. Chem., 41 (1902), No. 9, pp. 550–552*).—In the colorimetric method described ammonium sulphid is used instead of the potassium ferrocyanid commonly employed.

The determination of nitric acid in water by Noll's method, W. P. Kaschkadamov (*Jour. Ochran. Narod. Sdrav., 12 (1902), p. 491; abs. in Chem. Ztg., 26 (1902), No. 94, Repert., p. 309*).—The method is recommended.

The volumetric determination of nitric acid in drinking waters, O. Schmatolla (*Apoth. Ztg., 17 (1902), pp. 697, 698; abs. in Chem. Centbl., 1902, II, No. 18, p. 1152*).—A modification of the Marx method is recommended.

The litmus-paper test for milk, H. D. Richmond (*Chem. News, 86 (1902), No. 2238, pp. 192, 193*).—The use of litmus paper for testing the acidity of milk is considered very unsatisfactory.

Methods for the estimation of the proteolytic compounds contained in cheese and milk, L. L. Van Slyke and E. B. Hart (*New York State Sta. Bul. 215, pp. 81–102*).—This gives in detail the methods outlined in Bulletin 203 of the station (E. S. R., 13, p. 1087) and presented in full before the Association of Official Agricultural Chemists (E. S. R., 14, p. 108).

Concerning the coagulable material in egg white, L. Langstein (*Beitr. Chem. Physiol. u. Pathol. Ztschr. Biochem., 1 (1901), pp. 83–104; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 14, p. 663*).—Analytical data are reported and discussed.

Concerning the character of free fatty acids, E. A. Lösch (*Inaug. Diss., St. Petersburg, 1902; rev. in Chem. Ztg., 26 (1902), No. 30, Repert., p. 108*).—Under similar conditions butter and lard become more rancid, that is, form free fatty acids more energetically, than sunflower seed and almond oil. When butter becomes rancid, strong-smelling products are produced. On the other hand, when the liquid fatty oils become rancid such products are much less abundant, but bodies having a sharp and burning taste are produced. The increase in weight when fats become rancid is very slight, being greatest in the experiments reported with sunflower-seed oil. Generally speaking, the amount of volatile fatty acids is not large, while the amount of free nonvolatile fatty acids is much increased.

The estimation of starch in cereal grains, L. Lindet (*Jour. Pharm. et Chim., 6. ser., 14 (1901), pp. 397–400; Ann. Chim. Analyt., 7 (1902), pp. 41–43; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 14, p. 665*).—In this method of estimating starch in cereals the proteid material is removed by digestion with pepsin and hydrochloric acid and the starch which remains behind is treated with sulphuric acid and soda and then measured by determining the glucose and dextrin in an aliquot portion.

Filtration in determination of crude fiber, R. W. Thatcher (*Jour. Amer. Chem. Soc., 24 (1902), No. 12, pp. 1210, 1211*).—The author modifies the official method by filtering through asbestos wool placed in a large funnel on a platinum cone. The residue is washed into a platinum dish, the water evaporated, and the determination completed as usual. This procedure is especially adapted to the glycerol-sulphuric acid mixture used in the König method for fiber.

The analysis of vanilla extract, A. L. Winton and M. Silverman (*Jour. Amer. Chem. Soc., 24 (1902), No. 11, pp. 1128–1135*).—The authors give a modification of the Hess and Prescott method for the determination of vanillin and coumarin (E. S. R., 13, p. 420), which is designed to shorten the process without diminishing the accuracy of the method. The modification consists in the use of a larger quantity of 2 per cent ammonia and weighing the vanillin and coumarin immediately after evaporation of the ether solutions. Analyses are also given of a number of genuine and artificial vanilla extracts.

Uniform methods for the examination and valuation of foods, condiments, and commercial products in the German Empire (*Vereinbarungen zur einheit-*

lichen Untersuchung und Beurtheilung von Nahrungs- und Genussmitteln sowie Gebrauchsgegenständen für das Deutsche Reich. Berlin: J. Springer, pt. 1, 1897, pp. XIII+109; pt. 2, 1899, pp. XII+184; pt. 3, 1902, pp. X+184).—This work contains the methods for the examination of foods, condiments, and commercial products decided upon by a commission of food chemists appointed at the request of the Imperial Board of Health. A valuable point to be noted in connection with the work is the very full bibliography which accompanies each of the principal sections.

The chemistry of india rubber, C. O. WEBER (*London: Charles Griffin & Co., Ltd.; Philadelphia: J. B. Lippincott Co., 1903, pp. XI+314, pls. 5, figs. 16*).

Analysis of resins, balsams, and gum resins, K. DIETERICH, transl. by C. SALTER (*London: Scott, Greenwood & Co., 1901, pp. XIV+340*).

Physical and chemical methods for the quantitative determination of organic compounds, W. VAUBEL (*Die physikalischen und chemischen Methoden der quantitativen Bestimmung organischer Verbindungen. Berlin: Julius Springer, 1902, vol. 1, pp. XIV+593, figs. 74; vol. 2, pp. XI+530, figs. 21*).—Volume 1 deals with physical methods and volume 2 with chemical methods.

BOTANY.

The influence of varying amounts of carbon dioxid on photosynthesis, H. T. BROWN and F. ESCOMBE (*Proc. Roy. Soc. [London], 70 (1902), No. 464, pp. 397–413, pls. 6; abs. in Bot. Centbl., 90 (1902), No. 11, pp. 293, 294*).—A series of plants was experimented with to test the effect of varying amounts of carbon dioxid in the air on the photosynthetic processes of the leaves and on the growth of the plants. In one series leaves which were in some instances still attached to the plant were inclosed in air-tight cases through which air was passed, and the carbon dioxid content determined both before and after its passage over the leaf. In these experiments it was found that by increasing the carbon dioxid in the air an increase was noted in the photosynthetic power of the leaf in nearly the same proportion. In all cases where the illumination of the leaf was good, the photosynthesis was somewhat in excess of what might be expected from the increased amount of carbon dioxid. This was attributed to the fact that in the experiment the air which contained the greater amount of the gas also carried more moisture than ordinary air.

Experiments were conducted in a similar manner in which the illumination was insufficient and similar results obtained. Seedling plants were experimented with by inclosing them in vessels and subjecting them to varying amounts of carbon dioxid, the experiments indicating that the plants were not stimulated to increased growth by increasing the amount of carbon dioxid. On the other hand, there appeared to be a slight diminution in the increase of dry matter and a less development of leaf area. There were also certain morphological differences which are noted elsewhere (see below).

Similar experiments were conducted in a small greenhouse and carried on approximately from 1 to 2 months. The effect of an increased amount of carbon dioxid became most apparent within a week or 10 days of the beginning of the experiment. A marked difference was noted in the habit and general appearance of the plants owing to a stimulation of axial growth accompanied by a more or less pronounced shortening and thickening of the internodes. As it appeared evident that the increased photosynthesis did not contribute to the increase of dry matter of the plant, it is concluded that the transformation, translocation, and metabolism of the leaf reserves could not keep pace with the increased tendency to produce an extra amount of plastic material from the atmosphere. Without exception all the plants experimented with seemed to be best adapted to the atmosphere containing the ordinary proportion of carbon dioxid. The response which they made to slight increases in this amount appears unfavorable to the growth and reproduction of the plants, and it is believed that the comparatively sudden increase of the carbon dioxid in the air to an extent of 2 or 3 times the present amount would result in the speedy destruction of nearly all our plants.

The influence of an excess of carbon dioxid in the air on the form and internal structure of plants, J. B. Farmer and S. E. Chandler (*Proc. Roy. Soc. [London], 70 (1902), No. 464, pp. 413–423, figs. 5; abs. in Bot. Centbl., 90 (1902), No. 11, pp. 296, 297*).—The plants experimented upon as reported in the previous article were investigated by the authors to determine the relative dimensions of the internodes, the average relative area of the leaves, number of stomata per unit of leaf surface, anatomical differences in the stems and leaves, and the relative amount of starch and other cell contents in the two series.

The results are given in detail, from which it appears that an excess of carbon dioxid checks the growth of the internodes while prolonging the period of growth. The leaf area is more or less reduced by checking the growth of the leaves at an early stage. The absolute number of stomata per unit area of leaf surface is considerably increased, although the relative proportion of stomata to the number of epidermal cells remains practically constant. The anatomical structure of the leaf tissue is not materially altered. In the stem the xylem areas are less lignified, but the phloem shows no alteration. As a rule, there is a considerable increase of starch and a diminution of the amount of tannin and crystals of calcium oxalate. No alteration could be detected in the roots as a consequence of the increase in the carbon dioxid content of the air. These results are held to differ in a remarkable way from those obtained by Téodoresco (E. S. R., 10, p. 610), but that author compared plants grown in an atmosphere containing carbon dioxid with those grown in an atmosphere which was almost deprived of this source of carbon.

Investigations in chlorophyll assimilation of leaves, E. Griffon (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 5, pp. 303–305*).—Experiments are briefly reported on the effect of illuminating the different surfaces of the leaf on its chlorophyll assimilation. Leaves were placed in flattened tubes, so that the different surfaces could be subjected to direct and diffuse illumination, and the amount of gas given off determined. Differences were noted for the different surfaces of the leaf, and considerable inequality was observed, the differences seeming to be somewhat dependent upon the thickness of the leaf. In thick leaves, such as the cherry laurel, the proportion of assimilation of the upper and lower surface was as 100 : 48. In thin leaves, such as the maple, the proportion was 100 : 88, and in the case of leaves in which the mesophyll is more or less homogeneous, as in the case of the bamboos, the proportion was 100 : 92. In the case of leaves whose under surface is covered with hairs, as the linden, raspberry, and others, the difference was quite marked, and for such species as Eleagnus, in which the lower surface is covered with a dense covering of scales, the proportion fell to 100 : 36. The results seem to indicate that the palisade parenchyma of the leaves is adapted to the decomposition of carbon dioxid.

The influence of colored light on vegetation, G. T. Grignan (*Rev. Hort. [Paris], 74 (1902), No. 16, pp. 388–390*).—A review is given of the work of Zacharewicz, in which fruits were grown under colored screens, and of Flammarion's experiments with strawberries and other plants grown under the influence of different colored light.

The influence of different colored light upon plants, C. Flammarion (*Ann. Min. Agr. [France], 21 (1902), No. 2, pp. 395–397*).—In continuation of the author's investigations on this subject (E. S. R., 12, p. 909), experiments are reported in which Gladioli were grown under white, red, green, and blue lights. At the same time the bulbs of Montbretia were grown under similar conditions. The effect of the different illuminations is shown in tabular form, from which it appears that the plants are not similarly affected by the different kinds of light. Summarizing his work on the effect of colored light upon plants, the author claims to have shown that red rays favor the development of most plants, and the exclusion of blue and green is also favorable to their best growth.

The influence of electricity upon plants, C. FLAMMARION (*Ann. Min. Agr. [France], 21 (1902), No. 2, pp. 400, 401*).—A report is given of experiments in which beans were planted between copper and zinc plates buried in the ground and connected with a Leclanché cell. The author has experimented with this form of apparatus since 1894, and comparing the results finds considerable variation. The contradictory results are attributed to different conditions of the atmosphere, moisture, and temperature, all of which must be considered in similar experiments. In general, however, the electric current exercised a stimulating effect on the growth and production of the plants.

Certain relations of plant growth to ionization of the soil, A. B. PLOWMAN (*Amer. Jour. Sci., 4. ser., 14 (1902), No. 80, pp. 129–132*).—A description is given of a series of experiments on the relation of plants to electricity, conducted at the Harvard Botanic Garden. Among the facts recorded the author states that seeds placed near the anode are always killed by currents amounting to 0.003 ampere or more if continued for 20 hours or longer, while seeds placed near the cathode have in most cases been but little affected and under some conditions stimulated by the currents. When the seeds were germinated in water the difference was most pronounced when a relatively heavy current was passed through the water for only a short time. In this case the seeds near the anode were killed while those near the cathode were apparently uninjured. These differences are attributed to the dissociation of the atoms by the electric current. When seeds are germinated in distilled water through which a weak current is forced, the oxygen ions are in excess in that part of the solution where the stimulation occurs, and the hydrogen ions are in excess where the plants are killed. The different effects are believed to be produced by the electrical charges of the ions rather than by any mere chemical activity of the atoms. When seeds are placed in solutions of various acids, bases, or salts of a degree of concentration far below the killing point, they will germinate as well as in ordinary distilled water, but when a current of electricity of sufficient strength to propel the ions is passed through the solution that part about the anode becomes destructive to plant life.

From these facts it is concluded that negative charges stimulate and positive charges paralyze the embryonic protoplasm of plants. In support of this theory it is shown that if a flower pot containing several lupines of about 4 weeks' growth is charged with positive electricity the plants cease to grow, gradually lose their turgidity, and finally die; while if the charge be negative these effects are not produced, but the plants are stimulated. When seedlings are grown in an aqueous culture medium through which a weak current of electricity is passed, the root tips turn toward the anode. Normally the plant body is electro-positive to the soil in which it grows. The positive charge of the plant attracts the negative ions of the soil to its roots, and any circumstance which would facilitate the electrical interchange would be expected to be beneficial to the plant, as the reverse conditions would be detrimental. These phenomena are dependent not only upon temperature, light, aeration, and moisture, but also upon the nature of the electric current used, degree of dissociation, physical state of the ions, etc.

Effect of the composition of soil on the minute structure of plants, H. B. DORNER (*Proc. Indiana Acad. Sci. 1901, pp. 284–290, pls. 2*).—The object of the experiment reported was to determine whether the variations in soil produce other than gross changes in plants. A number of well-known plants were grown in loam, clay, and sand under otherwise identical conditions. The change in soil was found to decrease the size of the plant, its leaf surface, length of petioles, diameter of the stem, length of internodes, masses of roots, and to cause variation in color, the decrease being from the loam to the sand. In the histological characters there was found to be a decrease in the transpiring surface, the woody tissues of the root, the development of wood, and a few other characters in the same way as noted for the decrease in gross characters. In most cases the number of stomata was largest on the plants grown in the sand. In 5 cases out of 6 the thickest leaves were produced on the plants grown in the loam, and this increase was caused by a general increase in thickness of all the tissues in the leaf. In those plants bearing trichomes they were found least abundant on the plants grown in loam. In conclusion it is stated that the changes in gross structure were general for all the plants studied, while the changes in minute structure were more specific than general.

Influence of sulphocyanic acid on the growth of Aspergillus niger, A. Fernbach (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 1, pp. 51, 52*).—The author having observed the continued growth of *Aspergillus niger* in Raulin's liquid, in which ammonium sulphocyanate had been accidentally introduced, was led to investigate the subject further, and cultures were prepared containing known amounts of the chemical which were seeded with the spores of the mold. The tubes containing the cultures were subjected to the same conditions for a period of 6 days, when it was found that ammonium sulphocyanate had in no appreciable way checked the development of the mycelium. It was considered remarkable, however, that the fructification of the mold had been almost entirely checked by the addition of the sulphocyanate.

The presence of rennet in plants, M. Javillier (*Bul. Soc. Chim. Paris, 3. ser., 27 (1902), No. 15, pp. 818–822*).—A brief review and bibliography is given of investigations which showed the presence of rennet or similar substances in the juice of a number of plants, and the experiments of the author with rye grass (*Lolium perenne*) are described. The author found in the juice extracted from this grass a substance which is capable of coagulating milk, and this power was shown in the different dilutions studied. When 50 drops of the expressed juice were added to 10 cc. of sterilized milk, the coagulation was effected in from 2 to 4 hours. Oxalate of potash was found to retard the coagulation while the salts of lime favored it. When the lime and magnesia salts were neutralized by sufficient potassium oxalate, no coagulation was produced. In addition to this plant, the author gives a list of 17 species representing a wide range of plant families in which he has detected the presence of rennet in either the leaves, stems, or seeds.

Seed selection in Belgium, E. Leclercq (*L'Ing. Agr. Gembloux, 13 (1902), No. 2, pp. 75–81*).—On account of the great improvement in live stock in Belgium, which has been brought about through various societies maintained for that purpose, an attempt has been made to establish societies for the improvement of varieties of seeds and plants. The effect of various factors upon plant improvement, such as selection, heredity, atavism, etc., is described, and statements are given regarding the methods which are proposed to be followed by cooperative societies in seed and plant improvement.

ZOOLOGY.

Birds of a Maryland farm. A local study of economic ornithology, S. D. Judd (*U. S. Dept. Agr., Division of Biological Survey Bul. 17, pp. 116, pls. 17, figs. 41*).—This bulletin contains an account of observations made on a farm at Marshall Hall, Md., during frequent visits from 1895 to 1902. The purpose of these observations was to determine the economic relations of all the birds found under certain definite local conditions. The birds found on the farm are classified into several groups according to their feeding habits. Meadow larks, grasshopper sparrows, quails, mourning doves, crows, blackbirds, and certain other species fed chiefly in open fields. Field sparrows, chipping sparrows, song sparrows and other native sparrows, as well as English sparrows, perfer to feed under cover of bushes or herbaceous plants. The other birds observed on the farm are of less limited distribution, and include kingbird, oriole, cedar bird, catbird, hawks, owls, turkey buzzards, kingfishers, etc. A collection was made of insects, seeds, and plants on the farm in order to determine the kinds of food accessible to the birds. Crane flies and May flies occurred in large numbers and were eaten by many species of birds. Among the injurious insects upon which observations were made we may mention potato beetle, bean flea-beetle, tortoise beetles, cabbage worm, harlequin cabbage bug, 12-spotted cucumber beetle, pea aphis, tobacco worm, fall webworm, sawfly, locust leaf-mining beetle, flea-beetles, rose chafer, May beetle, cutworms, grasshoppers, ants, weevils, and oak scale. Observations made on insects injurious to farm crops indicated that birds are of little service in protecting farm crops against the attacks of injurious insects, and that they can not be depended upon for this purpose, but that insecticides must be used freely and repeatedly. Better service was rendered by birds in controlling the numbers of certain insects injurious to shade trees. Detailed notes are given on the relationship of birds to beneficial insects, such as honeybee, soldier beetles, tiger beetles, brown beetles, ladybirds, bees, and wasps. As a rule these beneficial insects were not fed upon to a great extent by the birds on the Maryland farm. Parasitic Hymenoptera, however, were eaten by 36 species of birds.

Considering the insect food of the 645 native birds of which the stomachs were examined, it was found that the birds were most insectivorous in May, when more than 90 per cent of the food consisted of insects. Throughout the entire period of observation insects furnished 60.41 per cent of the total amount of food eaten by the various birds. Of this amount beetles furnished the most, and white ants the least. Observations were also made on the feeding habits of the nestlings of grasshopper, sparrow, oriole, house wren, catbird, and other species. The greatest benefit from the presence of nestlings consists in their consumption of caterpillars and grasshoppers. Notes are also given on the destruction of poultry and game by crows, eagles, Cooper hawks, sharp-shinned hawk, and great horned owl. Mention is also made of the consumption of fish by certain aquatic species and the destruction of mice, rabbits, and carrion by various species of birds. Among the cultivated fruits the following were grown on the farm upon which the observations were made: Strawberries, cherries, grapes, tomatoes, melons, together with a number of wild fruits, including raspberries, elderberries, blackberries, mulberries, smilax, blueberries, wild cherries, etc. These fruits were eaten in varying quantities by the different species of birds. Notes are also presented on the distribution of seeds by birds, on the destruction of grain by crows, blackbirds, English sparrows, and other species, and on the destruction of weed seeds by native sparrows and other species. The bulletin also contains an annotated list of all the species of birds observed upon the farm.

As a result of the author's observations, it is concluded that at Marshall Hall the English sparrow, sharp-shinned hawk, and great horned owl are injurious and should be killed. The same is true of sapsucker, while the feeding habits of the crow present rather an unfavorable case for this bird. The other species of birds are believed to do rather more good than harm, under ordinary conditions.

The birds of Wyoming, W. C. KNIGHT (*Wyoming Sta. Bul. 55, pp. 174, pls. 48, figs. 14*).—The author presents an annotated list of about 300 species of birds observed in Wyoming. Brief notes are given on the habits and economic relations of the more important species. All of the illustrations for the bulletin are original.

The birds of North and Middle America, II, R. RIDGWAY (*Smithsn. Inst., U. S. Nat. Mus. Bul. 50, 1902, pt. 2, pp. XX + 834, pls. 22*).—In this volume the author continues his descriptive catalogue of the birds of North and Middle America. The volume contains a description of the following families: Tanagridæ, Icteridæ, Cœrebidæ, and Mniotiltidæ.

Handbook of birds of the Western United States. Florence M. Bailey (*Boston and New York: Houghton, Mifflin & Co., 1902, pp. XC+512, pls. 36, figs. 601*).—This volume contains an account of methods of collecting and preparing birds' skins, nests, and eggs; a study of life zones; migration of birds; economic ornithology; bird protection; and local bird lists from different localities in Western States by various authors. The larger portion of the volume is occupied with a description of the birds commonly found in the Great Plains, Great Basin, Pacific Slope, and Lower Rio Grande. Keys are presented for the convenient identification of the various species.

Birds of the Rockies, L. S. Keyser (*Chicago: A. C. McClurg & Co., 1902, pp. 355, pls. 8, figs. 39*).—In this volume the author presents a popular account of the common species of birds in the Rockies, with notes of their feeding habits and life history. A check list of Colorado birds, including nearly 800 species, is also presented.

Adirondack birds and their relation to forestry, E. A. Sterling (*Forestry Quart., 1 (1902), No. 1, pp. 18–25*).—Notes are given on the general relationship of birds to forestry. The woodpeckers, creepers, nuthatches, warblers, orioles, sparrows, thrushes, blackbirds, fly catchers, swallows, and crows and jays are considered to be most beneficial to forests on account of their feeding extensively upon injurious forest insects.

Some of the commonest birds in Egypt in their relation to agriculture, G. Bonaparte (*Jour. Khediv. Agr. Soc. and School Agr., 4 (1902), No. 1, pp. 16–19*).—Notes are given on the feeding habits of a number of birds, including *Corvus cornix*, English sparrow, *Motacilla alba*, rock dove, *Galerita cristata*, *Coturnix communis*, *Ardea bubulcus*, etc. All of the birds mentioned are more or less insectivorous in their feeding habits, and are believed to do more good than harm to agriculture.

Insectivorous birds of Victoria, C. French (*Jour. Dept. Agr. Victoria, 1 (1902), Nos. 4, p. 403, pl. 1; 5, pp. 520, 521, pls. 2*).—Notes are given on the biology and feeding habits of *Malurus cyaneus*, *Artamus personatus*, and *Melanodryas bicolor*.

Index animalium, C. D. Sherborn (*London: Cambridge Univ. Press, 1902, pt. 1, pp. LIX+1195*).—In this work the author contemplates publishing an alphabetical list of the specific names applied to animals from January 1, 1758, to date. This part contains a list of the specific names from January 1, 1758, to December 31, 1800. The author has avoided any attempt to indicate synonymy among specific names, although the fact that the name of the genus stands opposite that of the species in each case serves as a sort of generic synonymy. The date at which the specific name was applied is fixed as nearly as possible in each case, and the title of the publication is also given in an abbreviated form. In the concluding portion of the volume an alphabetical list of the generic names is given, and under each genus are mentioned all of the specific names which were applied between 1758 and 1800.

METEOROLOGY—CLIMATOLOGY.

Monthly Weather Review (*Mo. Weather Rev., 30 (1902), Nos. 4, pp. 157–244, figs. 12, charts 9, map 1; 5, pp. 245–292, pl. 1, figs. 13, charts 8; 6, pp. 293–340, figs. 5, charts 8; 7, pp. 341–392, figs. 11, charts 8; 8, pp. 393–432, charts 8; 9, pp. 433–472, fig. 1, charts 8*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of April, May, June, July, August, and September, 1902, recent papers bearing on meteorology, etc., these numbers contain the following articles and notes:

No. 4.—Special contributions on Studies on the Statics and Kinematics of the Atmosphere in the United States—IV, Review of Ferrel's and Oberbeck's Theories of the Local and the General Circulations (illus.), by F. H. Bigelow; Revision of Wolf's

Sun-spot Relative-numbers (illus.), by A. Wolfer; The Relation of the Sun-spot Cycle to Meteorology (illus.), by C. G. Abbot; and The Circulation of the Atmosphere in the Tropical and Equatorial Regions (illus.), by A. L. Rotch; and note on Jamaica Meteorological Service.

No. 5.—Special contributions on Studies on the Statics and Kinematics of the Atmosphere in the United States—V, Relations Between the General Circulation and the Cyclones and Anticyclones (illus.), by F. H. Bigelow; Annals of the Astrophysical Observatory of the Smithsonian Institution, Volume I, by S. P. Langley; The Winds and Rainfall of New Haven (illus.), by T. H. Davis; and A Mississippi Tornado, by S. C. Emery; and notes on meteorological conditions following the St. Vincent and Martinique eruptions, noises attending the eruption of Mount Pelee, dust storm and mud shower, and meteorological observations by travelers.

No. 6.—Special contributions on Hann's Meteorology, by F. H. Bigelow; Ground Temperature Observations at St. Ignatius College, Cleveland, Ohio, by L. J. Briggs; Unseasonable Weather in the United States, by E. B. Garriott; A Waterspout at Close Range, by O. L. Fassig; Studies on the Statics and Kinematics of the Atmosphere in the United States—VI, Certain Mathematical Formulæ Useful in Meteorological Discussions (illus.), by F. H. Bigelow; The First National Meteorological Congress of Mexico, by F. H. Bigelow; and Note on the Oscillation Period of Lake Erie (illus.), by R. A. Harris; and notes on apparatus for registering thunderstorms, lightning recorder, radio-active rain, laboratory work in physical geography and meteorology, sea temperature and shore climate, trees as forecasters of rain, meteorology in Argentina, dancing dervishes or dust whirls, the variations of the temperature of the free air at great altitudes, and halos, parhelic circles and contact circles (illus.).

No. 7.—Special contributions on Studies on the Statics and Kinematics of the Atmosphere in the United States—VII, A Contribution to Cosmical Meteorology (illus.), by F. H. Bigelow; The International Aeronautical Congress at Berlin, by A. L. Rotch; On the California Charts of Rainfall, by A. G. McAdie; and The Date Line in the Pacific Ocean, by J. Page; and notes on meteorology in Hawaii (see below), charting simultaneous observations, the season of vegetation, volcanic dust, and the variation of terrestrial gravity over the ocean.

No. 8.—Special contributions on Ocean Currents, by J. Page; Summer Meeting of the American Forestry Association, by A. J. Henry; The Permanency of Planetary Atmospheres, According to the Kinetic Theory of Gases, by S. R. Cook; and Textbooks and Works of Reference for Students of Elementary Meteorology, by W. F. R. Phillips; and notes on experimental agriculture at meteorological stations, and mountain stations for meteorology.

No. 9.—Special contributions on The Rainfall in the City of Madras and the Frequency of Sun Spots (illus.), by M. B. Subha Rao; A Dark Day in Washington, by M. Eells; and Indian Summer; and notes on weather fixes train loads, a comparison with the barometric standard of Costa Rica, physics and meteorology, meteorology at the British Association, Belfast, September, 1902, Weather Bureau men as instructors in meteorology, John T. Probert, Heinrich Wild, and Senor Augustin M. Chavez.

Meteorology in Hawaii (*Mo. Weather Rev., 30 (1902), No. 7, pp. 364–369, figs. 5*).—This is a very full abstract of an article by C. J. Lyons, territorial meteorologist, published in *Pacific Commercial Advertiser*, January 1, 1902. The history and present organization of the weather service in the Hawaiian Islands is explained and the climatology of the islands, especially with reference to the sugar industry and to health, is discussed. The wide variations in climatic conditions, particularly as regards rainfall in different parts of the islands, are illustrated by maps. The data reported show "that as to rainfall the islands have a great variety of climates. While some regions are almost rainless, others are deluged; and still others, like Honolulu, the chief place of resort, have a moderate rainfall only—the showers of an English

April with the temperature of an Italian June." A controlling climatic factor is the winds. "The prevailing winds are the northeast trades, at a temperature of about 70° F. and a saturation of about 65 per cent, but these are greatly modified by the mountain masses." These modifications are explained.

Studies on the statics and kinematics of the atmosphere in the United States, F. H. Bigelow (*U. S. Dept. Agr., Weather Bureau Doc. 273, pp. 62, figs. 29*).—These studies are reprinted from *Monthly Weather Review*, 30 (1902), pp. 13, 80, 117, 163, 250, 304, 347, and deal with a new barometric system for the United States, Canada, and the West Indies; methods of observing and discussing the motions of the atmosphere; the observed circulation of the atmosphere in the high and low areas; review of Ferrel's and Oberbeck's theories of the local and general circulations; relations between the general circulation and the cyclones and anticyclones; certain methematical formulæ useful in meteorological discussions; and a contribution to cosmical meteorology.

Report on the work of the Station of Agricultural Climatology of Juvisy during the year 1901, C. Flammarion (*Ann. Min. Agr. [France], 21 (1902), No. 2, pp. 395–421, figs. 14*).—As in previous years (E. S. R., 13, p. 627), observations were made on temperature of the air and of the soil at different depths, atmospheric pressure, humidity, rainfall, cloudiness, duration of sunshine and solar radiation, and underground waters, and also on the shedding and renewal of leaves, the action of solar rays of different colors on plants and animals (silkworms), and the influence of electricity on plants (see p. 548).

On the existence of a warmer current of air at an altitude of from 10 to 15 kilometers, R. Assmann (*Sitzber. Kgl. Preuss. Akad. Wiss. Berlin, 1902, No. 24, pp. 495–504*).

On some phenomena which suggest a short period of solar and meteorological changes, N. and W. J. S. Lockyer (*Proc. Roy. Soc. [London], 70 (1902), No. 466, pp. 500–504, figs. 2*).

Weather conditions, C. W. Peterson (*Rpt. Dept. Agr. Northwest Territories, 1901, pp. 5–24*).—The organization of the weather service of the Northwest Territories is briefly explained and data for temperature, precipitation, hailstorms, and crop conditions for a large number of stations are given in tables and notes.

Rainfall in the agricultural districts of Queensland, C. L. Wragge (*Queensland Agr. Jour., 11 (1902), No. 3, p. 208*).—This is a summary of observations at 41 different places in Queensland during the year ended July 31, 1902.

Meteorology (*Trans. and Proc. New Zealand Inst., 34 (1901), pp. 595, 596*).—A summary is given of observations on atmospheric pressure, temperature, rainfall, wind movement, and cloudiness during 1901 and 37 previous years at Auckland, Wellington, and Dunedin.

Meteorology, P. Bonâme (*Rap. An. Sta. Agron. [Mauritius], 1901, pp. 1–8*).—A summary is given of observations in Mauritius during the year 1901 on atmospheric pressure, temperature, humidity, and rainfall.

On the climate of Tunis, G. Ginestous (*Bul. Dir. Agr. et Com. [Tunis], 7 (1902), No. 25, pp. 413–429, figs. 5, charts 4*).—This is the fourth communication (E. S. R., 14, p. 124) on this subject and summarizes the available meteorological data for the three autumn months, September, October, and November.

Climatology of Poulo-Condore, G. Le Lay (*Bul. Écon. Dir. Agr. et Com. Indo-China, n. ser., 5 (1902), No. 6, pp. 433–439, figs. 3*).—Observations on temperature, pressure, rainfall, humidity, cloudiness, and wind movement during 1900 and 1901 at the meteorological station at Poulo-Condore, Indo-China, are reported.

Observations on thunderstorms and hailstorms in Steiermark, Kärnten, and Oberkrain, K. Prohaska (*Mitt. Naturw. Ver. Steiermark, 1901, No. 38, pp. 49–84, figs. 3*).—A record is given of the occurrence of thunderstorms and hailstorms in these regions during 1900 and previous years, as well as of the damage caused by such storms.

WATER—SOILS.

Water, A. J. J. Vandevelde (*Het water, zijn nut en zijne gevaren voor den mensch. Ghent: G. Van Doosselaere, 1902, pp. 23*).—A general discussion of properties and uses.

Six months' daily examination of Melbourne tap water, T. Cherry (*Proc. Roy. Soc. Victoria, n. ser., 15 (1902), pt. 1., pp. 69–75*).—The methods and results of bacteriological examinations are given.

Sanitary analyses of some Iowa deep well waters, J. B. Weems (*Proc. Iowa Acad. Sci., 9 (1901), pp. 63–70*).—Analyses of samples of water from 20 different places in the State are reported and the sanitary quality of the different waters is discussed.

On the purification of drinking water by means of ozone, E. Sugg and A. J. J. Vandevelde (*Reprint from Tijdschr. Toegepaste Scheik. en Hyg., 6 (1902), No. 1, pp. 8*).

The chemical composition of sewage of the Iowa State College sewage plant, J. B. Weems, J. C. Brown, and R. C. Myers (*Proc. Iowa Acad. Sci., 9 (1901), pp. 70–80*).—Chemical examinations of the sewage at frequent intervals are reported. The determinations made include free and albuminoid ammonia, nitrite and nitrate nitrogen, solids before and after ignition, and oxygen consumed.

A consideration of the action of saline irrigation water, C. F. Eckart (*Hawaiian [Sugar Planters'] Sta. Rpt. 1902, pp. 24–74, 76–100, pls. 7*).—A series of lysimeter experiments to test the effect of saline water on soils and sugar cane is reported.

"Five large tubs of the same dimensions and capable of holding 250 lbs. of soil were converted into lysimeters as follows: Over the perforated bottom of each tub a strip of coarse linen and another of wire gauze were placed to prevent the carrying away of particles of earth in the drainage waters following irrigation. Fifteen pounds of black sand formed a porous layer about 2 in. thick at the bottom of each lysimeter and on top of this were placed 200 lbs. of soil. Underneath each tub a large galvanized-iron funnel was attached to conduct all drainage into a receiver, where it was caught for measurement and analysis. . . . Two pieces of sound Lahaina seed cane, each bearing 2 eyes, were planted in each lysimeter. . . . An excessive amount of irrigation water was applied weekly throughout the experiments, [one] lysimeter receiving fresh water and the other lysimeters receiving water containing 200 gr. of salt to the gallon. Both the amount of water applied per irrigation and its percentage of salt were made large to intensify the resulting action on the soil, which was determined by the analysis of the respective drainage waters."

To note the fixing power of the soils for different fertilizing materials, as well as the influence of salt on nitrification, 4 of the tubs received each 5 gm. of potash as sulphate and 5 gm. of phosphoric acid as double superphosphate. The nitrogen, 10 gm. for each tub, was applied in different cases as nitrate of soda, sulphate of ammonia, and dried blood. One tub received no fertilizer.

Data regarding the amounts of irrigation and drainage, the composition of the drainage water, and evaporation are reported and discussed in detail. The general conclusions reached are that salt in "irrigation water renders available large amounts of the lime, magnesia, and potash in the soil. Where the water is saline, over-irrigations are necessary to keep the salt from reaching harmful accumulations in the soil, consequently enormous quantities of lime and magnesia, and a very large amount of potash must be washed out with the salt. Under such conditions the soil will eventually become depleted as regards these elements and become unproductive, unless they are replaced in the land. Occasional liming is considered especially necessary when saline irrigation waters are used.

"The quantity of salt that may be contained in irrigation water without producing material injury to the cane varies to a large extent with the nature of the soil and the volume of irrigation used per acre. The quantities and proportions of the ingredients, other than common salt, contained in irrigation water also influence in large measure the action of such water on the growth of cane.

"Cane planted in lysimeters grew apparently unchecked with its roots in contact with a soil water containing 195.75 gr. of chlorin to the U. S. gallon. Cane absolutely refused to grow where the percentage of chlorin in the soil reached 0.198, the soil containing 28 per cent of its weight of water.

"Cane in lysimeters irrigated to excess with water containing 200 gr. of salt to the gallon made an apparently normal growth. In other tests with the same amount of salt in the water, but where excessive irrigations were not applied, the cane died.

"In brackish irrigation water the quantities of lime and magnesia are usually rather high, the latter element being in excess of the former. If it were not for the fact that the lime of the soil is considerably more soluble than the magnesia, where saline irrigation is used the soil water would have an excess of magnesia over lime. The latter condition would be decidedly unfavorable to the growth of cane. As the lime is washed from the soil in greater quantities than the magnesia, it is necessary to apply the former element to the land to prevent the soil water from ultimately containing more magnesia than lime."

Water-holding power and irrigation of Hawaiian soils; the application of nitrate of soda; the accumulation of salt in Hawaiian soils, J. T. CRAWLEY (*Hawaiian Planters' Mo., 21* (*1902*), *No. 8, pp. 358–363*).—Observations on 7 different soils are reported which show that the amount of water in the soils when saturated in the field varied from 22.87 per cent to 29.61 per cent, while in the same soils saturated after being dug up the amount of water varied from 31.95 per cent to 39.9 per cent, showing "that in order to obtain the amount of water that any given soil will take up it must be saturated in the field." As a means of determining the amount of water which may be applied to a soil without waste it is proposed that determinations of the water content be made in the soil before irrigation and 5 hours thereafter, the difference between the two determinations being taken as the absorptive power of the soil. This, multiplied by 9,120, which is the number of gallons of water corresponding to each per cent of moisture in an acre of soil to a depth of 2 ft., gives the number of gallons of water which the soil will absorb.

Experiments are reported in which nitrate was applied before and after irrigation. "When nitrate was applied after irrigation there were 12 times as much nitrate in the first 6 in. of soil than when applied before the irrigation. In the above case a considerable quantity of nitrate of soda was lost through irrigation after putting on the nitrate, but practically all remained in the first 6 in. of soil, when it was applied after irrigation."

Observations on soils which were irrigated with water containing as high as 0.2 per cent of soluble salts show that there was very little accumulation of salt in the soils.

The reversion of superphosphate of lime in the soil, W. F. SUTHERST (*Chem. News, 86* (*1902*), *No. 2236, pp. 170, 171*).—Observations on mixtures of superphosphate with calcium carbonate, magnesium carbonate, and limonite in varying proportions are reported which show that the process of precipitation or reversion "does not by any means take place instantly, many days elapsing before all the water-soluble phosphate is rendered insoluble, and that only when a large excess of the reverting agents are present—a state of things not always occurring." Magnesium carbonate proves to be the most active reverting agent, iron oxid being next, and calcium carbonate last. Since the soil generally contains more iron oxid than magnesium or calcium carbonate the soluble phosphate is in most cases precipitated chiefly as an iron compound. The author's investigations indicate, however, that it is only from the calcium and magnesium compounds that the root sap takes up phosphoric acid.

"The neutral or basic phosphatic manures, such as basic slag or basic superphosphate, are in the insoluble form already, and being combined chiefly with calcium, the greater part of the phosphoric acid is thus available for plant food; this being especially the case with basic superphosphate, the whole of whose phosphoric acid is soluble in citric acid solution."

Soil chemistry and bacteriology, J. G. Lipman (*New Jersey Stas. Rpt. 1901, pp. 213, 214, pl. 1*).—A brief statement of the proposed work of this new department of the station, with a description of a method of securing samples of soil for examination.

On the classification of soils, K. O. Bjørlykke (*Ber. Norges Landbr. Hoiskoles Virks., 1901–1902, App. pp. 3–38, figs. 16*).

FERTILIZERS.

Handbook of fertilizers, M. Passon (*Handbuch des Düngewesens. Leipzig: M. Heinsius Nachfolger, 1902, pp. X + 335*).—The history of the use of fertilizers in ancient and modern times is traced; the composition of the plant and soil with reference to fertilization, methods of improving soils, and the nature and use of natural and artificial manures and fertilizers are discussed; and the methods of applying fertilizers to particular crops are explained. There is also a chapter devoted to the best means at the disposal of the farmer for determining the fertilizer requirements of his soils in which a simple sedimentation method of mechanical analysis, the author's apparatus and method for determining calcium carbonate (E. S. R., 13, p. 319), and a plan for plat experiments are described and the practical application of the results so obtained is briefly explained.

Phosphates, H. J. Patterson (*Pennsylvania State Dept. Agr. Bul. 94, pp. 87*).—A very full discussion of the sources and forms of phosphoric acid used in agriculture and their methods of preparation and application, based to some extent on compiled information, but largely on the author's investigations carried on at the Maryland Station for several years (E. S. R., 12, p. 930).

"All of the experiments which have been conducted upon the use of phosphoric acid in agriculture have given results which seem to warrant the general statement that much of the practice now followed in the use of phosphates is not founded upon facts. . . .

"There is no doubt but that the first step in the economical use of phosphates is to imitate nature and endeavor to keep the soil well supplied with organic matter; for it is only by such means that the phosphates contained in the soil naturally and those applied artificially can be fully utilized by the cultivated crops.

"It is very evident from all the tests cited that some crops, particularly the turnip family, have a greater ability than others to use crude or insoluble phosphates, and these experiments would certainly teach that the aim should be to employ such crops for rendering insoluble phosphates available and by such a practice save much that is now being spent for sulphuric acid and the cost of manufacturing the soluble phosphates.

"The experiments, in most instances, show that the presence of carbonate of lime is of considerable advantage in increasing the availability of phosphates.

"Some of the tests show that the iron and alumina phosphates are much more valuable as plant foods than is generally considered; in fact, under some circumstances they seem to be as soluble and even superior to lime phosphates.

"In regard to the so-called available phosphoric acid of commercial fertilizers, the results all point to the fact that there is no difference in it depending upon its source; that is, a pound of available phosphoric acid from a mineral source is just as valuable as a pound from an organic source. . . .

"The results of both field and plat experiments show that certain classes of phosphates are more available and hence have a higher agricultural value than would be given them by official methods of analysis. This condition would seem to warrant some modified method for analyzing such materials. This is particularly true of the tetra-phosphates when used on some soils."

Investigations relative to the use of nitrogenous materials, E. B. VOORHEES (*New Jersey Stas. Rpt. 1901, pp. 144–182*).—The investigations here reported are a continuation of those of previous years (E. S. R., 13, p. 727) and have in part been discussed in Bulletin 150 of the station (E. S. R., 13, p. 435). The composition of cow manure (mixed and unmixed solid and liquid) before and after being subjected to leaching and experiments with the different kinds of manure on oats followed by corn, without additional manure, are reported, the main purpose being to compare the availability of the nitrogen of the different kinds of manure with that of other fertilizing materials. Taking the nitrogen recovered by the crops as 100 in case of nitrate of soda, the relative availability observed was as follows:

Relative availability of nitrogen in different forms.

	Oats.	Oats and corn.
Nitrate of soda	100.00	100.00
Sulphate of ammonia	90.22	87.75
Dried blood	68.35	73.07
Solid manure, fresh	14.16	26.36
Solid manure, leached	9.67	21.99
Solid and liquid manure, fresh	40.10	51.46
Solid and liquid manure, leached	28.91	35.91

"It is quite apparent that in the residual effect considered, the availability of the manure, especially the solid manures, is increased very considerably. At the same time the availability of the nitrate and of the ammonia is decreased."

The availability of organic nitrogen in raw materials, J. P. STREET (*New Jersey Stas. Rpt. 1901, pp. 137–143*).—The solubility of nitrogen of 31 classes of materials in potassium permanganate solution, as determined by a method described in an earlier report (E. S. R., 11, p. 720), is reported and discussed. The average results obtained were as follows: Horn meal (1 sample) 95.9 per cent, ammonite (2 samples) 94.5, concentrated tankage (1 sample) 93.7, cracklings (1 sample) 93.5, dried blood (15 samples) 93, hoof meal (2 samples) 91, castor pomace (1 sample) 90, peanut pulp (1 sample) 89.3, pigeon manure (1 sample) 88.8, degelatinized bone (1 sample) 87.3, button bone (2 samples) 85.4, tankage (15 samples) 85.2, steamed bone (3 samples) 84.6, dissolved bone (2 samples) 83.1 and 62.7, dried fish (43 samples) 81.1, cottonseed meal (3 samples) 80.3, bone sawings (3 samples) 77.8, linseed meal (1 sample) 77.7, soft ground bone (1 sample) 71.6, wool waste (6 samples) 71.3, horse meat (1 sample) 70.4, raw bone (4 samples) 67.4, dissolved tankage (2 samples) 64.5, king crab (2 samples) 62.5, hair manure (1 sample) 54.6, burned garbage (1 sample) 51.5, garbage fertilizer (3 samples) 48.7, snuff sand (1 sample) 48.3, steamed leather (1 sample) 39.5, treated leather (1 sample) 33.4, raw leather (1 sample) 25.5 per cent. In case of dried blood the solubility ranged from 87.4 to 95.6, with an average of 93 per cent; dried fish from 56.1 to 92.9, with an average of 81.1 per cent; tankage from 65 to 93.2, with an average of 85.2 per cent.

A review of the investigations concerning denitrification (*New Jersey Stas. Rpt. 1901, pp. 183–210*).—A very complete review, which has been noted elsewhere (E. S. R., 14, p. 234).

Nitrate of soda in Africa, MAIZIÈRES (*L'Engrais, 17 (1902), No. 45, pp. 1070–1072, fig. 1*).—A brief discussion of the probable occurrence of extensive subterranean deposits of nitrate of soda in the region of the oasis of Touat, in Algeria.

New deposits of nitrate (*L'Engrais, 17 (1902), No. 46, pp. 1095, 1096*).—The occurrence of nitrate in Southern Algeria and in Death Valley, Cal., is briefly referred to.

On injury by perchlorate, B. SJOLLEMA and A. STUTZER (*Deut. Landw. Presse, 29 (1902), No. 90, p. 733*).—The question of the priority of discovery of the injurious effect of perchlorate on plants is discussed.

Fertilizing Hawaiian rice soils, J. T. CRAWLEY (*Hawaiian Planters' Mo., 21 (1902), No. 4, pp. 179–182*).—This article describes the present practice of using no fertilizer or applying only shrimp meal, and discusses the fertilizer requirements of rice as indicated by analyses of the rice plant and of a number of Hawaiian rice soils.

Fertilizing in fall and winter (*Mitt. Deut. Landw. Gesell., 17 (1902), No. 44, pp. 267, 268*).—A general discussion of the fall and winter application of lime and marl and phosphatic and potassic fertilizers.

Analyses of commercial fertilizers, M. A. SCOVELL and H. E. CURTIS (*Kentucky Sta. Bul. 102, pp. 167–228*).—The results of inspection of fertilizers during the spring of 1962, including analyses of 500 samples, are reported with brief explanatory notes. "The results of the analyses show that of the 500 samples analyzed, 55, representing 49 brands and 23 firms, fell so far below the guaranteed analyses in phosphoric acid, nitrogen, or potash, or any two, or all three of these ingredients, that the deficiencies could not be accounted for by variations in sampling or analysis. It is probable that in most cases variations can be accounted for by hurried or careless mixing at the factories, or gross mistakes in shipping one brand for another, but in one or two instances the results show a desire on the part of the manufacturer to guarantee a higher percentage of the essential ingredients than the goods contain. The great majority of the manufacturers, however, have furnished in most instances fertilizers fully up to guarantee."

Analyses of commercial fertilizers, W. L. HUTCHINSON (*Mississippi Sta. Bul. 77, pp. 27*).—Analyses and valuations of 345 samples examined during 1902 are reported.

Fertilizers (*New Jersey Stas. Rpt. 1901, pp. 17–77*).—A reprint of Bulletin 154 of the station (E. S. R., 13, p. 730) with addition of data regarding market prices of fertilizers in New Jersey during 1900 and preceding years, the text of the State fertilizer law, and lists of inspectors and of manufacturers whose goods were inspected during 1901.

Report of analyses of commercial fertilizers for the spring and fall of 1902, L. L. VAN SLYKE and W. H. ANDREWS (*New York State Sta. Bul. 216, pp. 103–167*).—The results of analyses of 446 different brands of fertilizers are reported. Of these, 309 were complete fertilizers in which the total nitrogen varied from 0.68 to 8.97 per cent, averaging 2.24 per cent; the water-soluble nitrogen from 0 to 5.72 per cent, averaging 0.93 per cent; the available phosphoric acid from 1.72 to 12 per cent, averaging 8.62 per cent; the potash from 0.55 to 13.33 per cent, averaging 4.67 per cent. In 50 out of the 309 brands examined the potash was in the form of sulphate free from excess of chlorids. The average amounts of nitrogen, available phosphoric acid, and potash exceeded the guaranteed averages by 0.32 per cent, 0.91 per cent, and 0.22 per cent, respectively. The average retail selling price of the fertilizers was $26.14, the retail cost of the separate ingredients unmixed, $20.76.

FIELD CROPS.

Annual report of the Alaska Agricultural Experiment Stations for 1901, C. C. GEORGESON (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1901, pp. 239–359, pls. 17*).—This report deals with experiments in growing cereals and vegetables at the Alaska Experiment Stations and at numerous other points, together with the progress made in the improvement of the stations during 1901. In addition to this matter the conditions and agricultural possibilities of the Yukon Valley, the region of the interior along the trails between Eagle and Valdez, the Fortymile country, the Tanana Valley, and the Copper River region are presented. Reports on the culture of field and garden crops by settlers at different points are given, and soil temperatures taken daily at various places for several years during the growing season, and meteorological observations at different points, for 1899 to 1900, inclusive, are tabulated.

Work at Sitka Station.—Swedish winter rye sown October 3, 1900, survived the winter and ripened September 15. Wheat sown at the same time did not live through the winter. Romanow spring wheat, which has given the best results in previous tests, was the only variety grown in 1901. Two plats of old ground were seeded May 8 and a plat of new ground May 11. The wheat on the old ground was harvested September 17 and the crop on the new ground October 3. The following varieties of barley were tested: Manshury, Sisolsk, Manchuria, Lapland, Black Hulless, and Chevalier. All of these varieties proved promising with the exception of Chevalier. Lapland was the earliest of the varieties grown. Black Hulless is not considered a very productive barley, but is recommended for its earliness and its value as a food material for the natives, being well adapted for this purpose on account of its naked kernels.

Of 2 varieties of oats under test, Burt Extra Early gave the best yield. This variety has proven one of the most promising and has never failed to mature. The other variety, North Finnish Black, did not mature satisfactorily and is not considered adapted to the region. The following quantities of fertilizing substances were applied per acre and compared in connection with growing North Finnish Black oats on new ground: 30 tons of seaweed, 30 tons of stable manure, 500 lbs. fish guano, 30 tons of seaweed plowed under and 500 lbs. of guano sown broadcast after plowing, and 30 tons of stable manure plowed under and 500 lbs. of guano applied broadcast after plowing. The oats were sown May 22 and on June 15 they ranked in appearance in the following order from the best to the poorest: (1) Manure and guano, (2) seaweed and guano, (3) manure, (4) seaweed, and (5) guano. The check plat, which had received no fertilizer, was the poorest. This relative rank was maintained throughout the season and the yields of hay obtained from the different plats were also in the same order. The yield on the check plat was practically nothing. "The experiment simply proves in an emphatic way . . . that new cleared and broken land is unproductive unless it is fertilized." The results of growing oats and peas as a mixture were quite satisfactory.

A plat of Orenborg buckwheat sown May 22 was ripe September 5. This variety and a so-called Finnish buckwheat can be grown successfully in Alaska, but Japanese and Silver Hull buckwheat have quite generally been failures. Flax on new ground was not a success. The results of vegetables on old ground were highly satisfactory, while on new ground they were practically failures. Seaweed was found to be an excellent fertilizer for potatoes, followed in productiveness by guano. The culture of raspberries, currants, and gooseberries was successful.

Work at Kenai Station.—Sisolsk rye was sown August 20, 1900, and harvested September 26, 1901. The plants grew from 5 to 6 feet high. At the close of the blossoming period the plants tillered profusely and much of the straw remained green up to the time of harvesting. Only about 50 per cent of the heads produced grain. Promising results were obtained with Sandomer and Yarasloff winter wheat. It is believed that on old ground and in ordinary seasons Yarasloff, the earlier of the two varieties, will mature. Sandomer showed a greater tendency to sucker. Several varieties of spring wheat were sown May 10 and 11, but owing to a drought the growing season was shortened and the crop was cut for hay September 6.

Manshury barley sown May 24 on old and new ground was harvested October 4. The old ground produced a uniform growth, while on the new ground the plants were quite uneven in height and threw up many suckers. At the time of harvest only the older heads were ripe. Beartown barley was grown on old ground from seed raised at the station in 1899. When the plants were going out of bloom about August 15 they were quite uniformly 36 inches high. This is the earliest variety grown at the station. It has a tendency to lodge badly. Sisolsk barley, grown on the same kind of ground as Beartown, threw up numerous suckers and consequently produced a very uneven crop. The early heads had produced firm grains, while the suckers were still green when the crop was cut October 5. Perm, on the same kind of ground as the two preceding varieties and from seed grown at the station, had begun ripening by September 16 and was harvested on the same day with Beartown and Sisolsk.

Experiments were carried on with 9 varieties of oats, all of which were harvested from October 1 to 5. Burt Extra Early produced a large percentage of ripe plants, although new suckers were growing up all the time. White Russian, grown from seed produced at the station, stood up well and showed a good percentage of ripe plants at the end of the season. Siberian oats tillered very heavily when wet weather set in and ripened only the earliest heads. Improved Ligowa tillered less than any other variety and about 90 per cent of it ripened. Most of the grain of the Black Finnish variety was hard when harvested, but the straw was not all yellow. The straw of Tobolsk was also partly green, and about 75 per cent of the grain ripened. St. Petersburg, Zhelanni, and Banner ripened only a small percentage of their grain.

Orenborg buckwheat, although a partial failure, produced more seed than Silver Hull. Japanese buckwheat was a total failure. Ufa and Yarasloff spring emmer were retarded by drought and did not mature. Riga flax yielded very little ripe seed. A part of the crop came up later than the rest and set no pods, but the straw was fine and straight and the fiber exceedingly tough. Good stands of flat peas, red clover, and red and alsike clover mixed were obtained.

Potatoes were grown on the level ground and in raised beds, as practiced by the Russians in the Territory. The raised beds did not show any merit. The potatoes were planted May 18 and dug September 27. The yield was about eightfold, and from 60 to 70 per cent were marketable. Among the vegetables tested cabbage, peas, beans, rhubarb, asparagus, and turnips were grown more or less successfully.

Work at Rampart Station.—Spring rye, barley, oats, spring wheat, and clover were grown, and notes on these crops to about the middle of August are given. The principal facts in connection with these experiments are that fall sown rye made a healthy and vigorous growth the following spring and produced plump and perfectly matured grain by the beginning of August, and that barley sown the latter part of May matured seed by the middle of August. Among the garden crops tried lettuce, kale, peas, onions, and carrots made a good growth. Buckwheat and potatoes were killed to the ground by frost July 31. At this date the tubers from native seed potatoes were larger than the tubers obtained from other sources.

Annual report of the Hawaii Agricultural Experiment Station for 1901, J. G. SMITH (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1901, pp. 361–379, pls. 8*).—The official steps taken in connection with the establishment of the station are summarized, and the work done upon the station site in the way of land improvement, the construction of buildings, and in general the preparation for experimental work, is reported in detail. The condition of the coffee industry is described and directions for the culture of coffee are given. Potato, sweet potato, taro, rice, and cassie culture in the islands is briefly noted. The raising of ducks, chickens, and turkeys is mentioned, and the lines of inquiry of most importance are suggested.

Annual report of the Porto Rico Agricultural Experiment Station for 1901, F. D. GARDNER (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1901, pp. 381–415, pls. 5*).—The initial steps taken toward the establishment of the station are summarized, and the agricultural resources and capabilities of Porto Rico are discussed. In connection with the consideration of the soils and climate of the island, the results of mechanical analyses of Porto Rican soils, and subsoils made by the Bureau of Soils of this Department, and the rainfall records from January, 1899, to December, 1901, are reported. The coffee, sugar, and tobacco industries are described, and statistics bearing on the subject are presented. The production of citrus fruits, alligator pears, mangoes, bananas, guavas, pineapples, cocoanuts, fiber plants, and a number of minor crops, is briefly noted. A description of stock raising on the island, including some statistics with reference to this industry and a note on insect pests, are also given.

Report of the agriculturist, E. R. Lloyd (*Mississippi Sta. Rpt. 1902, pp. 10–16*).—Thirty-two varieties of corn were tested in 1901 and the results obtained are briefly given, together with short descriptive notes for each variety. The results with 20 varieties of cotton, tested the same season, are also given. The application of 10 tons of barnyard manure increased the yield of seed cotton 304 lbs. per acre. The use of barnyard manure also had good effects on the yields of cowpeas and corn. Fall-sown wheat, flax, and alfalfa were winterkilled.

Report of Calgary Experiment Station, P. T. Bone (*Rpt. Dept. Agr. Northwest Territories, 1901, pp. 42–56*).—Variety tests with spring and winter wheat, oats, barley, spelt, rape, and potatoes are reported, and the culture of alfalfa, flax, and sugar beets is discussed.

Annual report on experimental farms and gardens in the Bombay Presidency (*Ann. Rpt. Expt. Farms and Gardens in Bombay Presidency, 1902, pp. 1–32*).—The results of culture tests with Australian saltbush, *Paspalum dilatatum*, *Sorghum vulgare*, Mauritius water-grass, Guinea grass, soy beans, rhea, cassava, sweet potatoes, maize, peanuts, *Pennisetum typhoideum*, and sugar cane are briefly noted. The use of different fertilizers in connection with growing these crops is also described. In many instances the results of this season confirm the conclusions drawn the previous year.

Methods of conducting plat experiments, B. R. Larsen (*Arbeidsregler for de spredte Akervekstforsog. Christiania: Johansen & Nielsen, 1902, pp. 27*).—Methods of conducting plat experiments at the Agricultural High School of Norway are outlined for the purpose of instructing experimenters cooperating with the institution.

Crop report for 1901 and 1902, F. G. Sly (*Dept. Land Records and Agr., Central Provinces, Season and Crop Rpt. 1901–2, pp. 1–11*).—Among other data statistical notes are given on the culture of *Andropogon vulgare*, *Cajanus indicus*, *Sesamum indicum*, *Cicer arietinum*, *Lathyrus sativus*, *Ervum lens*, *Phaseolus mungo*, and *P. aconiti folius*.

The effect of potash on plants, as shown in experiments with potatoes, tobacco, buckwheat, mustard, chicory, and oats, H. Wilfarth and G. Wimmer, (*Arb. Deut. Landw. Gesell., 1902, No. 68, pp. 106, figs. 14*).—The experiments here reported were conducted in the years 1896–1900, inclusive. The results obtained with the different crops for each season are tabulated in detail and discussed.

A soil mixture almost free from potash was used in the test. The potash applications were more effective in increasing the size of the plant organs containing the reserve material than in increasing the yield of the stems and leaves. This fact was especially marked in the case of potatoes and beets. Although an increase in the application of potash decreased the percentage of stems and leaves, it did not have a very marked effect on the roots. The influence of potash on the appearance and shape of the leaves was quite marked. The lack of potash manifested itself by a yellowish-brown color of the entire leaf, followed by spots or stripes located in the portions between the veins. These spots or stripes were also yellowish-brown, but much more intense than the rest of the leaf, and in some instances assumed a whitish appearance. The petiole of the leaf and the ribs retained their dark green color. The lack of potash was especially well shown in the leaf coloration of tobacco, buckwheat, and potatoes. The insufficiency of potash in the soil was also indicated by a characteristic curling of the leaves and by a sudden collapse of individual plants. The effects of insufficient supplies of nitrogen and phosphoric acid in soil differed materially from those due to a lack of potash. Nitrogen in insufficient quantities was characterized by yellow leaves, and a lack of phosphoric acid by dark green leaves. Sugar beets grown in soil lacking either nitrogen or phosphoric acid remained small, but did not decompose, and also contained a normal percentage of sugar. A heavy application of nitrogen when potash was lacking reduced the percentage of tubers and seed and also the percentage of starch, as compared with results obtained from light applications under the same conditions. This was especially noticeable with potatoes and beets. The percentages in these tests were based upon the entire plant.

The quantity of water transpired per gram of dry matter produced was found to increase when potash was applied. This result is considered due to the check in plant growth as soon as the potash supply has been used up, in which case the production of dry matter is arrested, while the transpiration continues. The quantity of water transpired under normal conditions for each gram of dry matter produced by the entire plant, as determined in these experiments, was as follows: Potatoes 200 to 230, tobacco 300 to 370, buckwheat 400, mustard 500, chicory 400, and oats 460 gm.

The various potash salts used, with the exception of potassium nitrate, did not cause any marked differences in the results. With potatoes potassium sulphate and potassium chlorid gave practically equal yields, but the starch content of the tubers was in favor of the sulphate. The effect of potash on starch formation was studied, and the results obtained showed that for each gram of potash taken up by the plant potatoes produced 36 gm. of starch, buckwheat 31, and oats 29. The sugar content in beets was subject to greater fluctuations than the starch content in the other plants, the range being from 8 gm. of sugar for every gram of potash taken up by the entire plant when no potash was given to 25 gm. when sufficient potash was supplied.

The effects of insufficient potash, phosphoric acid, and nitrogen were also compared. A beet grown in soil lacking potash weighed 26 gm. and contained only 2¼ per cent of sugar, while a beet grown in soil lacking phosphoric acid weighed only 14 gm. but contained 14 per cent of sugar, and one grown with insufficient nitrogen weighed 15 gm. and contained 17 per cent of sugar. Based on the dry matter in plants the sugar content was 2, 22, and 33 per cent for the beets grown on soil lacking potash, phosphoric acid, and nitrogen, respectively.

In studying the quantity of potash taken up by plants when present in more than necessary quantities it was found that the dry matter of the leaves of potatoes, tobacco, buckwheat, and mustard contained 5, 3, 2, and 3½ per cent, respectively. In the dry matter of sugar-beet leaves 5½ per cent of potash was found. In the seed and tubers the relation was found quite different. In the case of the greatest lack of potash the tubers of potatoes contained from 1.2 to 1.9 per cent of potash in the dry matter, the seed of tobacco 1.4 per cent, buckwheat 0.7 per cent, mustard 1 per cent, and oats 0.9 per cent. When the potash supply was increased, even until it reached a surplus, these figures were not increased to any great extent. Very large quantities of potash, however, caused a marked increase in the potash content of potato tubers, and in the case of chicory and sugar beets the potash content in the roots rose with the quantity of potash applied to the soil. Considering the total amount of potash taken up by the plant it is shown that without potash fertilization from 56 to 81 per cent occurred in the tubers, and when potash was applied in increasing quantities, the percentage rose to 93 but fell back to 70 when the application was in excess of the needs of the plant. In sugar beets receiving no potash from 10 to 20 per cent of the total potash taken up was found in the root, while in samples grown on a soil having received a normal supply it reached 44 per cent. Chicory contained 29 per cent of the total potash in the roots when no potash was applied and 77 per cent when a liberal application was made. The percentage of total potash of the plant in buckwheat and oats is quite constant, being 39 and 58 per cent, respectively, but an excess of potash in the soil caused a marked decrease. In the case of mustard the figures ranged from 14 to 31 per cent and decreased to 13 per cent when potash was given in excess. The figures for tobacco varied greatly with the different varieties and were quite irregular. The average figures show that for each gram of potash potatoes, buckwheat, and oats contained 42, 79, and 49 gm. of starch, respectively. Sugar beets contained 150 gm. of sugar for each gram of potash and chicory 247 gm. of carbohydrates calculated to the starch equivalent. Tobacco seed contained 25 gm. and mustard seed 30 gm. of fat for each gram of potash. It is calculated from the results of these experiments that 0.51 kg. of potash is required for the production of 100 kg. of fresh potatoes, 4.2 kg. for 100 kg. of tobacco leaves, 0.103 kg. for 100 kg. of green mustard plants, and about 1 kg. for 100 kg. of dry matter in the entire oat plant.

Fertilizer tests on grass, barley, and swedes (*Bd. Agr.* [*London*], *Rpt. Agr. Education and Research, 1900–01, pp. 48–50, 58–72*).—Fertilizing pasture with high and low grade basic slag gave inconclusive results, and there was no apparent difference in the effect of the 2 kinds of slag on the character of the herbage. In the results from fertilizer tests with barley in 1900, it was observed that the influence of nitrogenous manure was most apparent and that phosphatic fertilizers together with sulphate of ammonia also increased the yield of grain. The effect of potash was very slight. In 1901 results indicated that when the yields of grain and straw and the malting properties of barley are concerned a complete mixture of commercial fertilizers is most profitable. The following is considered a suitable application: 1 cwt. sulphate of ammonia, 2 cwt. superphosphate, 2 cwt. kainit. With swedes the general results show that better crops were grown by mixtures of commercial fertilizers than by barnyard manure. Sulphate of ammonia and nitrate of soda are much more effective than either potash or phosphates in increasing the hay crop. In this connection the dangers of heavy dressings of nitrogenous fertilizers are discussed and cases are pointed out where clover was killed by the use of sulphate of ammonia or of nitrate of soda.

Experiments with phosphatic fertilizers on meadows and rye, Remy (*Deut. Landw. Presse, 29* (*1902*), *Nos. 90, p. 729; 93, pp. 753, 754*).—The results of cooperative experiments with superphosphate, Thomas slag, and Algerian phosphate on meadows and rye are tabulated in detail and discussed. The results showed that in general phosphatic acid in finely ground Algerian phosphate is equal in value to phosphoric acid in the form of Thomas slag.

Alfalfa on Illinois soil, C. G. Hopkins (*Illinois Sta. Bul. 76, pp. 311–349, figs. 9*).—Results of pot and field experiments are reported. The purpose of the experiments was to determine the value of furnishing the soil with different elements of plant food in alfalfa culture and to study the effect of inoculating the soil with bacteria which enable the growing alfalfa plant to use the free nitrogen of the air.

The observations showed that the bacteria which enable alfalfa to obtain nitrogen from the air are usually absent in Illinois soils, and that the crop for this reason is entirely dependent upon the soil for its nitrogen. Without the proper soil bacteria an exceedingly rich soil and liberal applications of nitrogenous fertilizers are required to produce good crops of alfalfa. Even the rich black prairie soil of Illinois lacked sufficient available nitrogen for maximum crops, and applications of available nitrogen produced yields of hay from 2 to 4 times as large as crops entirely dependent upon the natural supply of the soil. An experiment further showed that inoculated soil produced crops just as large as soil heavily fertilized with commercial nitrogen. On most soils, except limestone soils, the application of air-slaked lime as well as inoculation with bacteria has proved beneficial.

In studying the effect of the different plant food elements in the different experiments it was found that a complete fertilizer with lime gave better results than applications lacking in one element or lime. The maximum losses when either nitrogen, phosphoric acid, or potash were lacking were 3,200, 1,440, and 480 lbs. of hay per acre, respectively. The author considers these figures as fairly representative of the relative values of the different elements of the soil under test. In the field tests air-slaked lime and bone meal were each applied at the rate of 320 lbs. per acre and potassium sulphate at the rate of 160 lbs. After inoculation the lime increased the yield of hay over no fertilizer by 1,020 lbs. per acre, and bone meal and lime together by 2,220 lbs. The total yields were 5,280 lbs. of air-dried hay from the unfertilized soil, 7,740 lbs. from the limed soil, and 10,000 lbs. from the soil which had received lime and bone meal.

The fixation of nitrogen by the bacteria was determined in both pot and field culture. The pot experiments indicated that on ordinary fertilized soil the alfalfa bacteria were capable of fixing 46.42 lbs. of nitrogen per acre. The dry matter of the crops from the uninoculated pots contained 2.59 per cent of nitrogen as compared with 3.62 per cent from the inoculated pots. The results of the field experiments were in perfect agreement with these results.

General directions for growing alfalfa are given and the present status of alfalfa culture in Illinois described.

Growing alfalfa in Kansas, H. M. Cottrell (*Kansas Sta. Bul. 114, pp. 51–85, pls. 7*).—This bulletin is a treatise on alfalfa culture under Kansas conditions. The requirements of the crop are discussed and full directions for the different cultural steps are presented. Attention is also given to the curing and feeding of alfalfa. In treating the different subjects the author draws upon results obtained at different experiment stations.

Fertilizer and culture experiments with hops, A. D. Hall (*Bd. Agr. [London], Rpt. Agr. Education and Research, 1900–01, pp. 83–90*).—Cooperative fertilizer tests have been in progress for several years, and the detailed results of the work are here tabulated and general conclusions presented. It is stated that since the hop is an all-round feeder, the fertilizer application should contain all the elements of plant food. The results further point to the fact that the problem of manuring hops resolves itself largely into a study of the soil in order to determine the deficient elements.

In the culture experiments different methods of cultivation were compared. A plat of 24 hills, which for 7 years received no cultivation at all except the mere destruction of weeds by the lightest hoeing, yielded 150 lbs. of green hops, while 2 other plats with the same number of hills, one deeply cultivated and the other uncultivated, for one year gave each 146 lbs. The entire tract receiving no cultivation averaged 2,400 lbs. of dry hops per acre. In this case the manures were simply put on the surface of the soil.

Experiments with hops, Remy (*Deut. Landw. Presse, 29 (1902), No. 88, pp. 716, 717*).—Fertilizer experiments were conducted to test the relative efficiency of different potash salts. It was found that the concentrated potash salts obtained at Stassfurt are equally effective with the higher priced martellin. The author arrives at the conclusion that when the lower maturing leaves of the hop plant approach a minimum content of phosphoric acid at the beginning of the blossoming period, the soil is in need of that element. The nitrogen requirement of hops varied remarkably with the different varieties. The English varieties required much more nitrogen than the continental sorts. A report on the work of breeding hops is given, but the experiments have not been in progress long enough to show results.

Seed selection of oats, J. Huntemann (*Deut. Landw. Presse, 29 (1902), No. 92, pp. 747, 748*).—Seed oats were separated by means of a centrifugal machine into 3 grades and compared in a culture test with unselected seed. It was found that the second-grade seed gave a better return than the first grade. In the variety under test a large percentage of grains had attached to them secondary smaller grains, and owing to the increased weight the centrifugal machine threw these combined grains into the heavier seed, although they did not really belong to that grade. This fact is given as explanatory of the small yield from the first-grade seed. The selection of seed by means of the machine was found profitable. Notes on the culture of oats are also given.

Paspalum dilatatum (*Dept. Agr., Central Provinces, Bul. 7, 1902, pp. 3*).—Culture tests with *Paspalum dilatatum* on different soils are reported and its value for India discussed. The results of the experiments seemed to indicate that it is a fairly good forage crop for cultivation with slight irrigation or with good moisture-retaining soils.

Potato experiments in 1901, B. D. HALSTED (*New Jersey Stas. Rpt. 1901, pp. 388, 389*).—In connection with other work the effect on the yield of potatoes by mulching with shavings was observed. The relative numbers for the yield were 360 on mulched and 310 on unmulched soil, and the relative weights of the crop 91 lbs. for mulched land and 67.3 lbs. for unmulched ground.

Fertilizer experiments with rape (*Deut. Landw. Presse, 29 (1902), No. 95, pp. 768, 769, figs. 4*).—Rape was sown on sandy soil in August and harvested the following July. The normal applications of the various fertilizing substances used per hectare were as follows: 120 kg. of nitrate of soda, 200 kg. of Thomas slag, 75 kg. of 40 per cent potash salt, and 400 kg. of carbonate of lime. Much the greater gain was obtained from double these amounts of the different substances applied together. The nitrate of soda was applied in September, March, and April, one-third of the total quantity being given each time.

On cane sugar and the process of its manufacture in Java, H. C. PRINSEN-GEERLIGS (*Altrincham, Eng.: Office of "Sugar Cane," 1902, 2. ed. enl., pp. 106*).

Experiments with sugar cane, C. F. ECKART (*Hawaiian [Sugar Planters'] Sta. Rpt. 1902, pp. 3-24*).—Culture and variety tests with sugar cane are reported. Planting tests as described in a previous report (E. S. R., 12, p. 1033) were continued, and tables are given bearing on the weights of the cane, quality of juice, and yields of sugar of the various plats at the close of the experiment. The varieties grown in these tests, as in the previous ones, were Lahaina and Rose Bamboo. The different methods of planting, as determined by the average production of sugar for 1900 and 1902, ranked in the following order: (1) One eye per 12 in., (2) one continuous cane in row, (3) one eye per 6 in., (4) two continuous canes in row, and (5) one eye per 18 in.

In connection with the report on the variety tests, the difference in plant-food requirements of the different varieties is pointed out. Among new varieties White Bamboo and Demerara No. 74 were extremely promising. Otaheite and Salangore, 2 Louisiana varieties, did not give favorable returns. The results of the different varieties for 1900 are given in the abstract of the report for that year, and the results from the ratoons of 11 of these varieties harvested in 1902 are shown in the following table:

Results from the ratoon crop of different varieties of sugar cane.

Varieties.	Cane per acre.	Cane juice.			Sugar per acre.	Available sugar per acre.	Cane per ton of available sugar.	
		Density.	Sugar content.	Purity coefficient.			Plant cane, 1900.	Ratoons, 1902.
	Pounds.		*Per cent.*		*Pounds.*	*Pounds.*	*Tons.*	*Tons.*
Lahaina	108,029	19.98	18.40	92.09	17,706	15,393	7.7	7.0
Yellow Caledonia	130,970	18.38	15.50	84.32	17,930	15,071	10.1	8.6
Yellow Bamboo	148,394	16.11	14.10	87.52	18,238	15,478	9.0	9.5
Fiji Purple	112,384	18.22	16.10	88.36	16,228	13,845	9.8	8.1
Big Ribbon	133,294	18.38	15.50	84.33	18,275	15,230	11.1	8.7
Striped Singapore	153,531	19.45	17.80	91.52	24,350	21,104	7.8	7.2
Louisiana Purple	130,680	18.45	16.80	91.05	19,759	17,089	8.9	7.6
Louisiana Striped	149,556	19.18	17.50	91.24	23,585	20,419	8.3	7.3
Louisiana Tibboo Mird	187,018	18.03	15.90	88.19	27,061	23,064	8.5	8.5
Demerara No. 95	163,005	19.52	17.50	87.60	25,184	21,396	7.6	7.6
Demerara No. 117	171,336	18.57	16.20	87.23	24,946	21,283	10.2	8.0

The composition of the cane and of the different parts of the plant, the mineral matter and nitrogen taken out of the soil, and the quantities of nitrogen, phosphoric acid, potash, and lime used per ton of sugar grown are given in tables for each variety.

Chlorids in tobacco, W. H. Pegram (*Abs. in Science, n. ser., 17 (1903), No. 418, p. 280*).—The work set forth in this paper was designed and is being prosecuted for the purpose of ascertaining whether there is a relation between the chlorids in tobacco and the chlorids in the fertilizer used in its production; also whether a high percentage of chlorids (as calcium and magnesium chlorids) affects the hygroscopic property of tobacco, giving abnormal and damaging results at certain stages of its preparation and manufacture. The data are insufficient as yet to justify a valid conclusion.

Experiments with wheat at Grignon in 1902, P. P. Dehérain and C. Dupont (*Semaine Agr., 22 (1902), No. 1121, p. 355*).—Of 5 different varieties Japhet produced the largest yield of grain, 50.1 quintals per hectare, followed by Massy with a yield of 43.1 quintals. The latter variety produced the largest yield of straw, 97.6 quintals per hectare. The yields of all varieties, owing to favorable moisture conditions, were quite large. The fertilizers were applied broadcast and in drills and the results were slightly in favor of the drill application.

HORTICULTURE.

Report of the assistant in horticulture, A. T. Jordan (*New Jersey Stas. Rpt. 1901, pp. 215–268*).—The author gives the results of another year's experiments to determine the effect of irrigation and the relative effects of fertilizers with and without irrigation upon the early and total yields of asparagus, blackberries, raspberries, strawberries, currants, and gooseberries. A similar report was given in 1900 (E. S. R., 13, p. 738). A further study of the value of an additional amount of 200 lbs. of nitrate of soda for some of these crops has been made and variety and fertilizer tests conducted with plums, cherries, dwarf and standard pears, and peaches. Tests of some newer varieties of bush fruits and of subirrigation experiments with them are also recorded, together with tests of a number of varieties of vegetables, of large *v.* small tomato seed, and of early and late starting for tomatoes. A table showing the daily and monthly precipitations for the year is included.

In the experiments with asparagus Palmetto yielded 33 lbs. more of early stalks and 1,512.7 lbs. more of total cut than any of 5 other varieties tested. The early yield was largest in every instance on the unirrigated plats, while in 3 out of 4 cases the total yield was largest on the irrigated plats. The total results of 4 years, during which the experiments have been under way, show a greater cut of early asparagus from the unirrigated plats than from the duplicate irrigated plats. The total cut, however, has been slightly larger from the irrigated plats. The advantage shown in the earlier years of the experiment from setting large selected crowns of asparagus has now entirely disappeared. The yields obtained by applying barnyard manure at the rate of 20 tons per acre have been greater than from the use of 500 lbs. of complete commercial fertilizers applied in the spring, or from 300 lbs. of bone and potash applied in the fall with 500 lbs. of complete commercial fertilizers applied in the spring, or from these same commercial fertilizers plus 200 lbs. additional of nitrate of soda applied at the time of cutting.

With blackberries the early yield during the 4 years of the experiment has averaged 22 per cent better on the irrigated than on the unirrigated plats, and the total yield 13.3 per cent better. The effects of the different fertilizers have been irregular. In 1901 Early Harvest gave by far the largest early yield of 6 varieties tested, as well as the largest total yield. Eldorado stood a close second as to total yield, but produced scarcely a third as large early yield as Early Harvest.

The yields obtained from irrigated plats of raspberries for 4 years have been but little larger than those obtained from unirrigated plats. The various fertilizers used have given conflicting results, but are quite uniform in showing no advantage from the supplemental amount of nitrate of soda (200 lbs. per acre). Turner was the heaviest yielding red raspberry and Souhegan was the best black raspberry tested in 1901.

With currants irrigation has increased the yield on an average for 4 years of over 15 per cent. The yield on the irrigated plats was lowest where nitrate of soda was used.

Gooseberries during a period of 4 years have been increased a little over 7 per cent in yield by irrigation. The heaviest yields have been obtained on plats fertilized with stable manure.

In the test with strawberries Bubach gave the largest early yield (1,441.9 qt.), with Glen Mary second (1,325.5 qt.). In the total yield Glen Mary led with 8,783.7 qt., followed by Bubach with 7,572.9 qt. per acre. Of the early sorts Excelsior was most productive in 1901, with Darling second. Sample was one of the heaviest yielding late varieties. In 1901 the unirrigated plats led in yield in all cases except early yield on one plat. During 4 years irrigation has been beneficial in slightly increasing the early yield only. Unirrigated plats fertilized with complete commercial fertilizers supplemented with nitrate of soda at the rate of 200 lbs. per acre have produced the largest early yield and the largest total yield. A fertilizer made up of bone, potash, and phosphoric acid has given the largest yield under irrigation. Relative to the culture of strawberries in hills *v.* matted rows, it is stated that beyond question some varieties are better adapted to hill culture than others. Nineteen varieties in 1901 gave greater returns from hill culture than from matted rows. In 1900 but 11 varieties gave increased yields in hill culture. Some of the most productive varieties in hills are Margaret, Ideal, Bubach, Glen Mary, Hall Favorite, and Seafard.

Experiments with plums, pears, peaches, and cherries have not yet been conducted long enough to warrant any definite conclusions. The yields obtained on different plats and with different varieties are noted as a matter of record. In a test of the Stringfellow method of setting peaches, as compared with the usual method, the Stringfellow trees taken as a whole have given yields much lower than those set in the usual way. The following data show the set of fruit in 1901 on peach trees that had been thinned in 1900:

Set of peaches on thinned trees.

	Number of fruits.		
	Tree 1.	Tree 2.	Tree 3.
Removed in thinning, 1900	599	272	216
Picked ripe in 1900	263	580	533
Total set, 1901	1,964	1,338	1,444

The table indicates the largest set of fruit on the tree that had been most severely thinned the preceding year.

Some experiments on the subirrigation of raspberries, currants, and gooseberries by plowing out a deep furrow, placing tile in this and planting the fruit over the tile, have been conducted now for 4 years, but have not given satisfactory results. In only 2 instances have the subirrigated plats given better yields than the controls. The difficulties of keeping the line of tile open are thought to be too great to render the use of tile for subirrigation of these fruits practicable.

In the test of garden beans Fillbasket Wax was the earliest maturing sort grown and Jones Stringless Wax the most productive. In comparisons of pole and dwarf Lima beans there has not been found much difference in earliness of maturing, but in amount of early fruit and total yield the pole sorts were considerably ahead. Alaska was one of the best early smooth peas grown. The percentage of total weight of peas that are edible was determined for 29 varieties. This varied from 33 per cent in Ameer to 57 per cent in Admiral. Next to Admiral the varieties giving the largest percentage of edible peas were Quality, Nott New Perfection, Surprise, Premium Gem, and Heroine.

With tomatoes, Hulsart Selection was the earliest maturing variety in 1901. Best of All showed the smallest percentage of culls and stood third in lowest percentage of rotten fruit. Over $\frac{3}{4}$ of the total yield of Early Dwarf Prolific graded as culls and 53.4 per cent of Early Bird was culls. A test was made of large *v.* small tomato seed. Fifty of the largest and 50 of the smallest well-formed seed of Beauty were selected and planted in pots in the forcing house each spring for 3 seasons. The average weight of early tomatoes from the large seed for 3 seasons has been 7 lbs. 15 oz., and from small seed 5 lbs. 7 oz. The total weight from large seed has been 29 lbs. 15 oz., and from small seed 29 lbs. 8 oz. The average size of the fruit has been 4.8 oz. for the large seed and 4.9 oz. for the small seed. The weight of the culls has been about the same in both cases, while the weight of the rotten fruit in the case of the large seed was 2 lbs. 12 oz., and from the small seed 1 lb. 13 oz. The weight of the 50 large seeds when planted was 0.176 gm. and of the small seed 0.071 gm. In another experiment tomatoes were started February 1 to 15, March 1 to 15, and April 1, and handled all the way from 5 times in the case of those planted February 1 to twice with those planted April 1. The best yields were obtained from those started February 15 and the next best from those started March 1. These results indicate, in the opinion of the author, that the latter half of February is the best time to start tomato seed. Thus started they require handling 3 or 4 times.

Experiments in crossing plants, B. D. HALSTED (*New Jersey Stas. Rpt. 1901, pp. 389–411, pls. 8*).—In continuation of previous work (E. S. R., 13, p. 743), plants were grown during the year from seed obtained in crossing Lima beans, tomatoes, cucumbers, eggplants, sweet corn, and salsify. The characteristics of the plants obtained, yields secured, etc., are recorded in considerable detail.

Beans (pp. 389–392).—In the case of beans the Henderson and Burpee types of dwarf Limas were crossed in 1900 and the seed obtained from these crosses planted in 1901. Of the hundreds of plants grown, all remained true to the dwarf type except 7 plants, which developed into vigorous climbing pole beans. The quality of the crossed beans compared favorably with the Burpee variety and was superior to that of the Henderson. The beans were not quite as large as those of the Burpee variety. The average yield was 27 pods per plant, five-sixths of which matured. This yield was about 4 times greater than that of the parent plants. In earliness the hybrid beans were ahead of the Henderson. Other experiments with wax beans indicate that this crop can be successfully grown continuously on the same ground under good cultivation for at least 8 years with 2 crops each season.

Tomatoes (pp. 392–396).—The crossing of yellow and red varieties of tomatoes in previous years resulted in producing plants of remarkable vigor. One of these plants produced fruits that were nearly seedless. When the seed of this plant was grown in 1901 an average crop of fair-sized fruits having a small percentage of seeds was produced. When Golden Sunrise, a yellow tomato, and Dwarf Champion, a red tomato, were grown alongside of each other the fruitfulness of the Golden Sunrise averaged 91, while that of Dwarf Champion averaged but 61. The Dwarf Champion came into earlier bearing than Golden Sunrise, and if green fruits be excluded from the record there would not be much in favor of the Golden Sunrise variety. The tomatoes in this experiment made the eighth crop grown continuously on the same land. The experiment brings out the fact that tomatoes may be successfully grown on the same land continuously if good tilth, spraying, and the prompt removal of diseased fruits are attended to.

Cucumbers (pp. 396–398).—The third generation of crossed cucumbers was grown in 1901. The original cross was White Spine upon White Pearl. The 1901 crop was not uniform, the fruit varying exceedingly in color, size, and form. One of the main purposes of the original cross was to remove the spines from the fruit. This was accomplished on some fruits, while others were remarkably rough. A plate is given showing 17 fruits, all differing from one another.

Eggplant (pp. 398–400).—In 1900 the New York Improved Spineless eggplant was crossed upon Long Purple. Plants obtained from the seed of this cross were grown in 1901. They were remarkably vigorous. The fruits were of good color, form, and size, and especially well suited for slicing. The quality was excellent. The fruits matured nearly a month earlier than the New York Improved, and 6 weeks in advance of Long Purple. This cross is considered very promising.

Sweet corn (pp. 400–408).—In the experiments with sweet corn the pink, white, and black grains obtained in crossing Egyptian, a white variety, with Black Mexican have been planted. The resulting ears have had mixed grains in every instance, but when pink grains were planted they constituted the largest percentage of the grain on the resulting ears; likewise black grains predominated on the ears when black grains were planted, and white grains when white seed were planted. It was observed in these experiments that the largest number of 8-rowed and 12-rowed ears were obtained from 10-rowed seed, 10-rowed ears from 8-rowed seed, and ears having more than 10 rows from seed having from 12 to 14 rows. Nothing was gained by starting corn indoors and setting it in the field when the plants were 4 weeks old. When pollen was prevented from reaching the silks of the ears the silks grew to an unusually large size and remained green 2 or 3 times longer than the normal period. Good ears were obtained by inbreeding, but the corn thus treated matured much less rapidly than corn grown in an open field. The inbred corn reproduced the peculiarities of the stock.

In another experiment corn was bred with the object of increasing its prolificness. Seven ears produced on 3 stalks were taken for seed. From this seed 144 stalks were grown. Of these 44 bore large single ears, 83 bore 2 marketable ears each, and 17 bore 3 or more ears each. It is stated that the number of stalks bearing 2 and 3 ears each were much larger in this plat of selected corn than in other plats of corn in which the seed was not selected with regard to prolificness.

Some further notes are given upon salsify hybrids, particularly as regards the color of the flowers produced. Nothing definite as regards the edibleness of the roots obtained is reported. Other crosses mentioned are those of 2 species of Martynia, an unsuccessful cross of the trumpet creeper upon Martynia, a successful cross of the ordinary field flax (*Linum usitatissimum*) with the ornamental species (*L. grandiflorum ?*).

Plant breeding and improvement in our experiment stations, B. D. HALSTED (*New Jersey Stas. Rpt. 1901, pp. 411–419*).—A brief review is given of the plant-breeding work conducted at each of the experiment stations up to the present time.

Apparent exceptions to the Mendel law of dissociation in hybrids, C. CORRENS (*Ber. Deut. Bot. Gesell., 20 (1902), No. 3, pp. 159–172*).—The author presents some experimental data showing that Mendel's law does not appear to hold between crosses of black sugar corn (*Zea mays coeruleodulcis*) and pop corn (*Z. mays leucoceras*).

Experiments with salad plants, B. D. HALSTED (*New Jersey Stas. Rpt. 1901, p. 419*).—Swiss chard was sown May 13 and again July 28. Both lots grew well, but the early chard was somewhat affected with leaf blight while that sown later was nearly free. This result is in accord with that of earlier work of the station, which indicates that the blight does not flourish on late-sown chard. Plants of Swiss chard removed to the greenhouse in the autumn furnished leaf stalks through the winter and were again planted out in the spring, where they made a fine early growth. New Zealand spinach has been successfully transplanted from the greenhouse and also grown from seed. The plant thrived through the hottest weather, producing an abundance of leaves. This is considered an excellent salad plant and worthy of more attention.

Culture of vegetables, E. Yunge (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1901, pp. 86–91, fig. 1*).—Results secured in the culture of a large number of vegetables are briefly reported, together with notes on the wintering of vegetables.

Experiments on the use of commercial fertilizers for market gardening in 1901, J. Aeby and E. Hegh (*Rev. Gén. Agron.* [*Louvain*], *11* (*1902*), *No. 7–8, pp. 342–364*).—The experiments here reported have been under way for 2 years. The results obtained in 1900 have been previously noted (E. S. R., 13, p. 849). The results of 1901 are in entire accord with those of the preceding year, and indicate that for market garden crops the most valuable results are obtained when commercial fertilizers are employed to supplement barnyard manures.

Experiments in onion growing at Dominica (*Agr. News* [*Barbados*], *1* (*1902*), *No. 14, p. 213*).—At the agricultural school at Dominica, in the West Indies, seedling onions gave a larger and more even crop than sets. The latter, however, were found easier to grow. Teneriffe seed was used. The first sowings of the seed came up well, but later seedings germinated badly, and in some instances scarcely any grew.

New way to transplant (*Pacific Coast Fruit World, 14* (*1902*), *No. 11, p. 15*).—Description of a new method of moving trees. It consists essentially of a steel basket made up of 14 shovels of $\frac{5}{16}$-in. plow steel. These are hinged to a steel platform surrounding the tree. The shovels are driven into the ground around the tree and the whole tree lifted by screw power.

The Russian apple and its outcome; behavior in the Northwest, A. T. Erwin (*Rural New Yorker, 61* (*1902*), *No. 2752, p. 717*).—Notes on the culture of hardy apples in the Northwest. Patten Greening is stated to be one of the most satisfactory varieties thus far originated for the Northwest.

Cold storage of apples, F. W. Rane, H. H. Lamson, and F. W. Morse (*New Hampshire Sta. Bul. 93, pp. 65–88, figs. 2*).—The authors have investigated the keeping qualities, prices, value of wrapping, and chemical changes of apples in cold storage, and the keeping qualities of apples when taken out of cold storage.

In 1899 apples were sent to Boston November 20 to be put in cold storage. At monthly intervals thereafter until July 11, 2 barrels of the fruit were examined and the number of firsts, seconds, and thirds counted. No extra precautions had been taken in preparing the apples and they were believed to fairly represent the ordinary condition of fall-purchased apples. The figures given indicate that apples of this sort can not safely be allowed to remain in cold storage after April, since they rapidly decay after that date. Even with more carefully picked and assorted apples the experiments of the following season showed that the apples were at their best only up to about April 15. The prices obtained for this fruit when sold on commission varied from $2.57 to $3.10 per barrel net. The fall market prices for apples ranged from $1.25 to $2.00 per barrel. Under the conditions of the experiment it paid well for putting them in cold storage.

A table is given showing the range of prices for apples for each of the months from November 1 to May 1 for the years 1896 to 1900. These indicate satisfactory profits from cold-storage apples.

Six barrels of apples were sent to each of 2 cold-storage systems in Boston to test the relative merits of cold air and brine in apple storage. The apples in each case were examined at different periods from February 5 to July 11. Up to April the figures given do not show much difference in the keeping quality of the apples under the 2 different systems of storage, but after that date there was a slightly greater loss under the brine system.

In an examination of the apples in the different parts of the barrel to determine where the greatest amount of decay occurred, 33⅓ per cent of the decayed fruit was found within 6 in. of the headed end.

In order to test the general impression that fruit does not keep well when taken out of cold storage, 150 apples were taken out of cold storage each month from February to May and placed in 3 trays of 50 each. Two trays were placed in greenhouses having temperatures of approximately 70 and 55° F., respectively. The third was placed in a cool cellar having an approximate temperature of 40°. The apples did not touch each other in the trays and were not covered. These apples were observed and a record kept of their condition. The average time it took for all the fruit to become spotted under the 3 temperatures given was about as follows: Warm temperature, 13 days; medium, 32 days; cellar temperature, 40 days. The following conclusions are drawn from this experiment:

"The length of time that apples keep when taken out of cold storage is in direct proportion to the height of the temperature they are subjected to. Cold-storage apples taken out during the spring months, if kept in a relatively cool place, will keep much longer than if allowed exposure to the ordinary temperatures. Cold storage simply retards decay, and when the fruit is taken out at a time when conditions are so much more favorable for decay, the fruit decomposes faster than in the fall or winter when the temperature is low."

Part of the data given on the influence of cold-storage in the decay of apples and on the effect of wrapping apples in paper has been previously reported (E. S. R., 13, p. 352). Further work along the same line was carried out by packing Baldwin apples in bushel boxes and placing them in cold storage in Boston. Four control boxes were placed in the station cold storage, the average temperature of which was 40–45° from November 1 to the middle of April, 45–50° from the middle of April to the middle of May, and 50–65° from the middle of May until July 1. The average temperature of the apples in the Boston cold-storage system was 34°. When the apples were examined January 2, those in the Boston storage were still perfect, while 4 per cent of the station stored apples showed decay. Examinations in March and April showed over 35 per cent more sound apples in the Boston cold storage, and the June examination showed 69 per cent more sound apples than in the station cold storage. As regards wrapping apples, it was found that the wrapped apples kept considerably better than the unwrapped, particularly during the latter months of storage; but little difference was noticed until March 1.

Tables of analyses are given showing the variation in composition with reference to invert and total sugar and acid in apples for several months after picking, during each of the years 1898 to 1901. The differences in composition between hand-picked apples and windfalls are also shown. From these data it is shown that "chemical changes take place within the apple which are independent of decay, and result in the over-ripe condition recognized by 'mealy' pulp and lack of flavor. Low temperatures hinder the chemical changes, while high temperatures hasten them. Apples intended for cold storage should be carefully handled and placed in the storehouse as soon as possible after picking."

Experiments in preserving winter fruits in peat, E. Yunge (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1901, p. 75*).—Various sorts of apples were packed in peat direct. The peat had been sifted and was perfectly dry. The fruit thus treated kept in good condition, while that stored in the usual manner spoiled. When the fruits packed in the peat were rusty they acquired a disagreeable taste, while those with smoother skins were normal. It is recommended, therefore, that rusty fruits be first wrapped in paper before packing in peat. It is further recommended that fruit taken out of the peat be used up as rapidly as possible and that no more be taken out than can be used at once.

The culture and manufacture of tea in British India and Ceylon, with reference to its value for the tea culture of the Dutch Colonies, A. SCHULTE (*Beihefte Tropenpflanzer, 2 (1901), No. 2, pp. 117, fig. 1, dgms. 5*).—The author visited British India and Ceylon, and made a careful study of tea culture in those countries. The report includes a discussion of the history of tea culture; also a discussion of the botany, climate, soils, planting, cultivation, harvesting, and manufacture of tea.

Examination of wilted tea leaves for astringent matter showed 12 per cent in the bud and first leaf, 8½ in the second and third leaves, 5 in the fourth and fifth leaves, and 3½ in the old leaves. Examination of the fresh leaves as picked for manufacture in 2 different factories showed 10½ and 11 per cent, respectively, of astringent material. The same leaves after rolling contained 16 and 17 per cent, and the finished tea 7 and 12 per cent, respectively. These figures indicate that the percentage of astringent material in the tea was considerably increased by rolling but decreased by subsequent oxidation.

Three varieties of tea grown at an elevation of 450 meters showed an average astringent content of 8⅚ per cent; grown at an elevation of 2,000 meters the astringent content averaged 11⅙ per cent. While a better quality of tea is thus produced in the higher altitudes, a greater quantity is produced on the same area on the lower lands.

Further experiments were made to determine whether the change in color from green to yellowish brown, the development of the aroma, and the decrease of astringent matter with the accompanying decrease of bitter content were due to the work of micro-organisms or to oxidation. The leaves were found to acquire the desired yellowish-brown color at a temperature of 35 to 40° C. The acid content of the leaves increased considerably during the rolling process, but decreased again during the oxidation process. Several different samples of tea leaves were sprayed with different strength solutions of acetic acid before rolling, for the purpose of preventing the development of fermentation bacteria. The presence of the acid in the leaves was found to delay oxidation, but not to prevent it. Further study is necessary before definite conclusions can be stated regarding the chemical changes which take place in the tea during fermentation.

The book of the strawberry, E. BECKETT (*London and New York: John Lane, 1902, pp. 83, pls. 4, figs. 7*).—This is the ninth of the series of Handbooks of Practical Gardening, edited by H. Roberts. Besides a very satisfactory presentation of cultural methods for strawberries, it includes directions for the culture of raspberries and blackberries, including the Loganberry. While some of the methods of English strawberry culture differ considerably from American methods, the work nevertheless contains many suggestions regarding propagation, culture, forcing, etc., which will be found useful to American strawberry growers.

Self and cross pollination, R. GOETHE (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1901, pp. 62–64, fig. 1*).—Further work is reported on the number and color of seeds obtained in crossing certain varieties of pears and apples. The shape of the seed is illustrated in some instances. The work is in continuation of that reported last year (E. S. R., 13, p. 746).

Study of grape seeds, A. BONNET (*Ann. École Nat. Agr. Montpellier, n. ser., 2 (1902), No. 2, pp. 73–134, pls. 3, figs. 3*).—A comprehensive study of the seeds of grapes with reference to the identification of the various species, hybrids, and varieties of both American and European grapes. Good illustrations are given of the seeds of nearly all of the varieties described.

Report of the viticultural station at Eibingen, R. GOETHE ET AL. (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1901, pp. 26–56, pls. 2, figs. 9*).—This report covers work in grafting grapes, rooting grape cuttings, and growing both in the nursery. The percentages of plants that grew, using various species of grapes as stocks, are tabulated. Other matters reported upon are the yield and quality of grapes obtained in the station vineyard, forms of pure species of Vitis and various hybrids, culture of new hybrids, preliminary notes on the ripening of 1-year-old wood, and the injurious effects of pruning on the growth of the tree trunk. The average thickness of the trunks of a large number of trees pruned in the pyramidal form was 8.4 cm.; pruned only by removing dead and crossed branches, 9.7 cm. The following year the pruned trees attained a diameter of 9.5 cm. and the unpruned trees 11.7 cm. Contrary to the usual belief that regular pruning serves to make stockier trees, these experiments indicate that strong pruning prevents the rapid growth of the stem rather than furthers it.

The carob tree, A. GUYADER (*Bul. Dir. Agr. et Com. [Tunis], 7 (1902), No. 25, pp. 430–453*).—Detailed account of the nature, culture, composition, and uses of the carob tree and its products is given, its varieties are described, and the production in different countries noted. The fruit of the carob tree is used primarily as a stock food, but sometimes for human consumption. A sherbet is made from it by the Turks, and it is also used in some European countries as an adulterant of coffee.

English pleasure gardens, ROSE S. NICHOLS (*New York: The Macmillan Co., 1902, pp. XXIV+324, pls. 66, figs. 185, plans 10*).—Popular descriptions of classic, monastic, mediæval, Tudor, Elizabethan, Stuart, Italian, eighteenth century, and modern gardens and grounds. A bibliography of the works of 170 different authors treating of the various kinds of gardens noted above is included.

The book of climbing plants, S. ARNOTT (*London and New York: John Lane, 1902, pp. XIV+124, pls. 6*).—An English book on climbing plants, in which the characteristics, culture, and value of the various annual, hardy deciduous, hardy herbaceous, and hardy evergreen climbers, hardy wall shrubs, climbers for growing under glass, roses, and clematis are popularly discussed. The book is the tenth in the series of Handbooks of Practical Gardening, edited by H. Roberts.

The book of old-fashioned flowers, H. ROBERTS (*London and New York: John Lane, 1901, pp. 111, pls. 9*).—A popular account is given of the old-fashioned hardy flowers grown in the cottage gardens of England. The garden is described with reference to the flowers growing in it during each of the 4 seasons of the year. In the latter part of the book brief chapters on soils, manures, seed sowing, etc., are given. The book is the fourth in this series of Handbooks of Practical Gardening.

A plea for hardy plants, J. W. ELLIOTT (*New York: Doubleday, Page & Co., 1902, pp. 76, figs. 52*).—"This book has not been written to teach the art of landscape gardening, but the need of it." It is believed that $1 intelligently spent on the grounds about the house will afford more beauty than $10 spent in the house. Detailed plans are given for flower gardens and for laying out city and suburban lots of various sizes. The art in gardening and the beauty in hardy plants are brought out in the numerous illustrations, which constitute one of the chief features of the book.

Collection of Haarlem flowers (*Florilegium Harlemense. Haarlem: De Erven Loosjes, 1901, pls. 60, descriptive text*).—This work is published under the auspices of the council of the Algemeene Vereeniging voor Bloembollencultuur of Haarlem. It includes descriptions and life-sized colored illustrations of the bulbous and tuberous rooted plants of the Haarlem export trade. The book is published in 1 volume in the 4 languages, Dutch, English, French, and German.

A new hybrid poppy, F. CAYEUX (*Rev. Hort. [Paris], 74 (1902), No. 2, pp. 525–528, figs. 3; abs. in Amer. Gard., 23 (1902), No. 415, p. 783, figs. 3*).—A prolific, many-branched, yellow-flowered poppy (*Papaver pilosum*) was crossed on *P. bracteatum*, a poppy bearing large single red flowers, for the purpose of increasing the flowering capacity of the latter. When *P. pilosum* was used as a mother plant no seed was obtained, but when *P. bracteatum* was used as a mother plant a few seed were found. Out of a dozen plants grown from this seed, 3 plants with pale orange-red flowers, and intermediate in form between the two parents, have been found and given the name *P. piloso* by *bracteatum*. The parents and hybrid are illustrated. Three other plants obtained had a much more dwarfed form and resembled neither parent. The author's experience with hybrid poppies is stated to differ from that of Gordon in that the individual plants of the first generation of hybrids differed widely from each other instead of being fairly uniform, as has been the case in Gordon's work.

Experiments with phloxes and their allies, B. D. HALSTED (*New Jersey Stas. Rpt. 1901, pp. 422–424*).—Lists are given of phloxes, cobaeas, gilias, and polemoniums grown. It was noticed that the phlox plants as they grew older contained many green forms. These plants had flower clusters with the bracts much prolonged and oval-shaped. The corollas were with long tubes and the lobes not fully expanded, giving a half open appearance to the bloom.

Experiments with ornamental plants, B. D. HALSTED (*New Jersey Stas. Rpt. 1901, pp. 421, 422*).—Notes are given on the following plants grown at the station: Chrysanthemums, peonies, Japanese redbud, hibiscus, cannas, nasturtiums, mignonette, petunias, and verbenas. A hardy type of chrysanthemum which has been grown at the station for several seasons was this year attacked for the first time by a rust. Japanese redbud has proved too tender for the cold winters and hot summers prevalent in New Jersey.

Experiments with lawn grasses, B. D. HALSTED (*New Jersey Stas. Rpt. 1901, p. 421*).—Nine plats of lawn grass were seeded at the station in 1896. A record is given of the percentages of the different grasses for each of the years up to 1901 for each plat. The highest percentages of the original grasses sown are found in the Rhode Island bent grass, Kentucky blue grass, and wood meadow grass (*Poa nemoralis*) plats.

FORESTRY.

The Western hemlock, E. T. ALLEN (*U. S. Dept. Agr., Bureau of Forestry Bul. 33, pp. 55, pls. 12*).—An attempt is made to remove the prejudice which has hitherto existed toward the Western hemlock (*Tsuga heterophylla*) by pointing out its uses, economic value, and conditions under which it may be grown, lumbered, and manufactured. This timber has suffered severely on account of the poor reputation given to its eastern relative. The wood of the Western hemlock is far superior to that of the eastern tree and is suitable for all uses in ordinary building, for paper pulp, for wooden ware, and particularly adapted to indoor finishing. The bark, which is abundantly produced, contains half as much again of tannin as that of the eastern tree. Under favorable conditions it reproduces abundantly and grows very rapidly.

The Western hemlock is found from Alaska to California, and in the northern portion of its range as far east as Montana. It seldom occurs as pure forest, but is usually associated as a mixture with red fir, spruce, cedar, and in northern California with redwood. The conditions favorable for the reproduction of hemlock are not those which are advantageous for most of the associated species, and it is probable that hemlock will reforest cut-over lands when red fir would fail to establish itself. This tree frequently attains a diameter of 8 ft. and a height of 250 ft., although as a rule the mature trees are from 3 to 5 ft. in diameter. It is very tolerant of dense shade and germinates and grows readily under conditions which its associated species would not tolerate.

The principal enemies, both fungus and insect, are described, after which the value of the wood for various uses, its durability, defects, etc., are shown. Tables are given showing the value and yield of first and second growth hemlock in a number of localities, and a brief statement given relative to the value of the bark as a source of tanning material. A list of the trees of Oregon and Washington, which are associated with the Western hemlock, completes the bulletin.

The hardy catalpa in commercial plantations, W. L. HALL (*U. S. Dept. Agr., Bureau of Forestry Bul. 37, pp. 1–48, pls. 23*).—Attention is called to the value of the hardy catalpa (*Catalpa speciosa*), and 4 commercial plantations, all of which are situated in Kansas, are described at considerable length. The methods of planting, cultivation, and management are given, the soils described, and the rate of growth, products, and value are shown. Among the more important notes from the standpoint of the culture of this tree, it is shown that the hardy catalpa reaches its best growth only in very rich soils. In poor, sandy soil one of the plantations described has given no return, while in deep, rich loam it has given a clear annual profit of $21.55 per acre.

When grown in pure forest or mixed with trees no taller than itself the catalpa should be protected by shelter belts of taller trees. If a large number of trees are to be planted it will be found cheaper to grow them from seed than buy them from a nursery. The trees should be closely planted, 4 by 4 ft. probably giving the best results, and thinned and pruned as required. The cutting back of the young trees after 2 or 3 seasons' growth, and the training up of a single sprout from the stump, greatly hastens the height growth and prevents side branches on the lower part of the trunk. When the first growth of the plantation is for any reason bushy and undesirable, a better growth can be secured by cutting the stand clean and reproducing it by sprouts. The best growth of catalpa has not been obtained in pure plantations, but so far in the Middle West only the osage orange and Russian mulberry have been found adapted to planting with the hardy catalpa. A high percentage of straight limbless poles can be secured only with the most careful treatment. The tree has a tendency toward crookedness and branching, which requires close attention to correct.

Eucalypts cultivated in the United States, A. J. McClatchie (*U. S. Dept. Agr., Bureau of Forestry Bul. 35, pp. 106, pls. 91*).—The purpose of this bulletin is to give information concerning the characteristics of a number of species of Eucalyptus, their climatic requirements, and their uses, together with the directions and suggestions as to their propagation and culture. Means are also furnished for the identification of seedlings and mature trees so that specimens growing throughout the Southwest may be readily identified. At the present time, throughout the southwestern United States the eucalyptus trees are planted more extensively than any other exotic forest tree. Their adaptability for shade, windbreaks, fuel, timber, etc., makes them probably more valuable than any other forest tree planted on this continent. In the bulletin only those species which attain a diameter of over 1 ft. and a height of 40 to 50 ft. are discussed, and only those species which have fruited are treated. The author believes that when the merits of these trees are more fully understood, they will be planted more extensively as a covering to the treeless portion of the semitropic portion of the United States and will serve to furnish fuel, timber, and many other useful products.

A history of the lumber industry in the State of New York, W. F. Fox (*U. S. Dept. Agr., Bureau of Forestry Bul. 34, pp. 59, pls. 19*).—The primitive forest and its composition is described, after which the development of the lumber industry is traced. The first sawmills are said to have been established in 1623, the machinery for which was brought from Holland. The early methods of lumbering are described, after which, in considerable detail, the more modern methods are reviewed. Notes are given on the volume of lumber business, the profits of the industry, and the lumber markets of New York.

Report of the superintendent of forests, W. F. Fox (*New York State Forest, Fish and Game Com. Rpt. 1900, pp. 20–44, 97–155, pls. 11, figs. 3*).—A report is given on the forest reserves of the State and the various investigations incidental to the care, custody, and control of the forest lands owned by the State in the Adirondack and Catskill regions. The forest reserve belonging to the State amounts to 1,370,928 acres, embraced in more than 5,000 separate lots. Under the present law the scientific management of these forests is not properly provided for, and suggestions are given for the modification of the law. In connection with the Bureau of Forestry of this Department the working plans have been made for a number of tracts. As a portion of his duties the State forester is obliged to collect statistics on the forest products of the State. These are given in detailed and tabular form.

A detailed report is also given on the forest fires occurring during 1900. During that season more than 14,000 acres were burned over, the loss of timber destroyed being estimated at $12,400. Other losses bring the total up to about $20,000.

A study in practical reforesting, J. Y. McClintock (*New York State Forest, Fish and Game Com. Rpt. 1900, pp. 87–96, pls. 7*).—In connection with proposed sylvicultural investigations to be carried on by the State forestry department, the author visited a number of places where forest-tree planting has been undertaken and reports at considerable length on the plantation made in the Stephen Girard estate, situated in the watershed of Lost Creek, in Schuylkill County, Pennsylvania. On this tract a series of plantings has been made, beginning with 1881. About 1,200 acres have been planted, the principal species being European larch, hardy catalpa, Scotch pine, white pine, black cherry, and Douglas spruce. In all, about 250,000 trees have been planted, the different plantings being described in some detail. The native species of trees have been protected and the estimated income derived from the entire tract is a little in excess of 4 per cent upon the cost of the industry.

A forest working plan for township 40, Hamilton County, New York, R. S. Hosmer and E. S. Bruce (*New York State Forest, Fish and Game Com. Rpt. 1900, pp. 157–236, pls. 11, maps 4*).—This is a reprint of Bulletin 30 of the Bureau of Forestry of this Department (E. S. R., 13, p. 458).

Culture experiments with foreign trees in Austria, A. Cieslar (*Ueber Anbauversuche mit fremdländischen Holzarten in Oesterreich. Vienna: Wilhelm Frick, 1901, pp. 55*).—Notes are given on the distribution, characteristics, and culture relations of a large number of exotic species of trees, most of which are of American origin. Among those described are the following: Douglas, Sitka, blue, Engelmann's, and white spruce; Port Orford cedar; Pacific arbor vitæ; juniper; Japanese larch; white, Bank's, and pitch pine; balsam fir; red, bur, and pin oak; black walnut; butternut; Shagbark and bitternut hickory; sugar and silver maple; white ash; wild black cherry; and paper birch.

The woodman's handbook, I, H. S. Graves (*U. S. Dept. Agr., Bureau of Forestry Bul. 36, pp. 148, figs. 15, map 1*).—The purpose of this handbook is to give a collection of tables and rules of practical use to lumbermen, foresters, and others interested in the measurement of wood and timber. Only such information is given as is deemed of immediate practical value to American woodsmen. The unit of measure most commonly used in this country is the board foot, and tables are given based upon that system of measurement. Tables are given for the measurement of standing trees, the volume tables for such species as have been worked out in this country being included. The various methods of estimating standing timber are described and the essentials for a forest working plan are outlined. Special instruments useful to the woodsman are figured and their uses described.

Methods of estimating and measuring standing timber, A. Knechtel (*New York State Forest, Fish and Game Com. Rpt. 1900, pp. 67–86, pls. 4, map 1*).—About a dozen methods for the estimation of the amount of standing timber are described, and the advantages and weaknesses of each pointed out.

Wood, G. S. Boulger (*London: Edward Arnold, 1902, pp. 369, pls. 4, figs. 66*).—This is a manual of the natural history and industrial applications of the timbers of commerce. After describing the origin, structure, and development of wood, the author gives keys for the recognition and classification of different kinds of woods. The various defects and diseases to which wood is subject are described and suggestions given relating to the selection, seasoning, storage, and durability of different kinds of timber. The various sources of wood supply are described as well as the present methods for testing timber. The sources, characters, and uses of the principal woods of commerce are described, about 750 different kinds being enumerated. A bibliographical appendix is added giving the most important sources of information.

Forest reserve manual (*U. S. Dept. Int., Gen. Land Office, Forest Reserve Manual, 1902, pp. 97, figs. 2*).—General information is given relative to the object of forest reserves and their utilization, and the present organization for the protection and control of the forest reserves is described. The duties of the various forest officers are defined and instructions given for the care and propagation of the forest. The various forms of applications and permits for grazing, timber cutting, irrigation structures, etc., are given, and the penalties for violation of the rules are stated. While containing much information of general interest, the manual is intended primarily for the guidance of forest inspectors, rangers, and other officers.

SEEDS—WEEDS.

The germination of seed as affected by sunlight, V. Jodin (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 10, pp. 443, 444*).—A series of experiments was conducted by the author, in which seeds were placed in vessels and covered with screens of different colors. Others were sealed in tubes and placed in similar situations. A report is given of seeds of cress which were placed in tubes, as described above. Under the conditions of the experiments all the seeds which had not been thoroughly dried lost their germinative power, falling from 100 per cent to 0 germinations within 2 months. If the tubes were opaque or completely transparent, the resistance of the seed seemed to depend more upon the heat action than the illuminating action of the sun's rays. Seeds dried and placed in a tube with a small quantity of phosphoric acid had a germination of 92 per cent in March, 1896. This tube was exposed continuously to the sun's rays until August 4, 1902, at which time 69 per cent had retained their vitality.

Observations on the duration of the germinative property of seeds, J. Poisson (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 6, pp. 333–335*).—A number of instances are cited in which the germination of seeds has apparently been suspended for a number of years. In one case an annual species of Lathyrus, which had at one time been very abundant in a park, seemed to have entirely disappeared on account of the increased shade furnished by the trees. After about 30 years of dense growth the trees were thinned and the leguminous plant reappeared. Another instance cited is that of the occurrence of *Juncus bufonius* in 2 pots filled with soil taken at a considerable depth in an excavation made in a part of Paris. Another instance is the appearance of alders in great abundance on ditch banks in a tract of land which had been drained and on which, so far as known, no alders had ever been grown, nor were any known to exist anywhere in the vicinity from which the seed could have come.

The preservation of the germinative power of seeds, L. Maquenne (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 3, pp. 208, 209*).—A study is reported on the effect of drying on the germination of seeds. The amount of moisture lost by seeds of castor bean, parsnip, radish, and wheat, when subjected to the temperature of a drying oven, as well as the loss when kept in a vacuum, are shown. It was found that seeds retained their germinative faculty much longer when thoroughly dried and kept in a vacuum than when exposed to the open air.

Report of the section of seed control, A. Voigt (*Bot. Mus. u. Lab. Waarenkunde Hamburg, Ber. Abt. Samencontrole, 1901, X, pp. 11*).—A report is given of the activity of the seed control station in connection with the botanical laboratory, Hamburg, for the year ended June 30, 1901. During the period covered by this report 2,273 samples of seed were investigated, an increase of about 25 per cent over the previous year's work. The principal investigations were for the presence of dodder seed, and purity and germination tests. Red, white, and alsike clover, serradella, alfalfa, and various species of grass seed formed the bulk of all the seed investigated. The investigations for dodder showed the presence of varying quantities of seed of that parasite in about 38 per cent of all the specimens examined. A detailed report is given showing the maximum, minimum, and average purity and germinative ability of the different kinds of seed tested, and also the variation from the percentages obtained the previous year. Some of the special seeds investigated are discussed in detail.

Report of the seed control station at Hernösand, C. G. Strokirk (*Ber. Verks. Frökontrollanst. Hernösand, 1901, pp. 15*).—A report is given showing the maximum, minimum, and average vitality, purity, and intrinsic worth of 684 samples of seed tested between July, 1900, and June 30, 1901. The principal seeds were those of cereals, grass and forage plants.

Report of the seed control station at Luleå, 1900–1901, P. Hellström (*Ber. Verks. Kem. Växtbiol. Anst. Frökontrollanst. Luleå, 1901, pp. 33–38*).—A report is given on 234 analyses of seeds and upon the certification of 355 kilos of timothy seed. The results of the different analyses are shown in tabular form, the maximum, minimum, and average purity and germination being given. A report is also given of the weed seeds which were found most abundant in seed of rye, wheat, oats, timothy, and vetch.

Report of the seed control station at Molkom, 1901, J. A. Andersson (*Red. Verm. Frökontrollanst. och Kem. Lab. Molkom, 1901, pp. 1–20*).—Detailed reports are given of tests made on 436 lots of seed which were tested during the year. In addition to the usual report of purity and germinations of the several samples, tables are given showing the average purity, vitality, etc., for all seed tests made since 1893 to the date of the report. The principal weed seeds and the relative amounts which were found present in grass and forage plant seed are shown, as well as the results of tests on the relative value of seed obtained from different countries, effect of treating seed for smut prevention, etc.

A study of dodders, B. D. Halsted (*New Jersey Stas. Rpt. 1901, pp. 451–457, pls. 2*).—During the winter a study was made of a number of species of dodder, the seed of which were collected from clover, flax, and other seed. The germination of the dodder was determined and its subsequent growth ascertained. Compiled notes are given regarding different species of dodder and the plants which they attack.

Experiments with weeds, B. D. Halsted (*New Jersey Stas. Rpt. 1901, p. 420*).—In continuation of the experiments previously reported (E. S. R., 13, p. 756) the present status of the weed plat is described. At the present time brome grass, field bindweed, and yellow daisy have become very aggressive, while some reported previously have dropped from the head of the list and others have almost totally disappeared. A number of new weeds have appeared, and there seems to be a tendency for the ground to be covered with a growth of low plants such as clovers, grasses, and bindweeds, above which is a cover of tall growing plants such as sweet clover, yellow daisy, smartweed, and velvet leaf.

DISEASES OF PLANTS.

Report of the botanist, B. D. Halsted (*New Jersey Stas. Rpt. 1901, pp. 385–459, pls. 13, fig 1*).—During the period covered by this report less attention has been given to the subject of plant diseases and their control than in previous years and more to the breeding of various varieties of plants. These are noted elsewhere. Observations have been continued on the asparagus rust and the usual work reported on weed investigations. Some studies were made on various species of dodder and these are reported at some length. The experiments with turnips, which have been carried on for 7 years, have been terminated, as it is fully demonstrated that lime is a satisfactory remedy for the club root and that turnips do not thrive as a continuous crop for many years. Experiments for the control of potato scab have been continued, but on a considerably reduced scale. The results thus far obtained have not been uniform and while sulphur gave promise of value, before final judgment is rendered the tests need to be carried on upon a number of different kinds of soil.

The experiments with spraying were limited almost entirely to the use of soda-Bordeaux mixture with the same formula as that used in the previous report (E. S. R., 13, p. 756). The tomato diseases were of so little consequence that but little difference was noted in the sprayed and unsprayed plats. A leaf spot of chard due to *Cercospora beticola* developed to a considerable extent, and spraying with soda-Bordeaux reduced it to a considerable degree. Plats of cucumbers, chard, and ornamental plants were sprayed with kerosene emulsion to test its value as a fungicide, but the results obtained do not indicate that it has a value in checking the blights to which these plants were subject.

An experiment was carried on to determine whether Paris green could be used with the soda-Bordeaux mixture, the fungicides being applied to potatoes, eggplants, squashes, cucumbers, and beans. Each plat was treated 3 times at intervals of 10 days without harmful results, although the Paris green was added in a much higher percentage than is commonly employed. During the season covered by the report observations were made on the asparagus rust and attempts were made to ascertain its distribution throughout the United States. By means of letters sent to different stations it was found that this disease extends from New England to the Dakotas and south to Texas. As a rule there is an apparent decrease in the amount of asparagus rust, which is attributed to the fungus parasites of the rust and the more extensive cultivation of resistant varieties. Upon the college farm at the station the variety Palmetto was found to be comparatively free from rust. The variety Argenteuil is also quite resistant. It is claimed that the rust was more abundant on the west than on the east side of the plats, and it is suggested that this was due to the quicker drying of the dew on the side toward the morning sun.

The investigations on pear blight have been terminated on account of the change in ownership of the orchards on which the spraying and pruning were being carried on. The results for the different years' treatment are reviewed and summarized. Brief notes are given on ergot on different species of grass, on corn smut and cucumber blight, grape mildew, tulip mold, and fungi as related to weather.

The occurrence of clover broom rape is mentioned and the plant described. The species present was *Orobanche minor*. *O. ramosa* was also found attacking a tomato plant on the experiment station grounds.

In continuation of the investigations described in the previous report (E. S. R., 13, p. 757) a study was made on dimorphism of buckwheat, the third generation of the plants seeming to show that there was a tendency for the pistillate form to exert some control over the progeny.

Plant diseases observed during 1901, E. MARCHAL (*Bul. Agr.* [*Brussels*], *18* (*1902*), *No. 2*, *pp. 228–230*).—Brief notes are given on the smut of cereals, potato scab, bacterial rot of potatoes, fairy rings, cherry diseases, and pear blight.

A report on cotton disease in Egypt, F. FLETCHER (*Jour. Khediv. Agr. Soc. and School Agr.*, *4* (*1902*), *No. 3*, *pp. 122–126*).—A preliminary report is given of a disease of cotton which was called to the attention of the author in 1902. Upon visiting the infected region he was informed that the disease had been noticed since 1898, and that it made its appearance where Sea Island cotton seed from America had been planted. The disease is believed to be of American origin, and reappears each year, the fungus being capable of remaining in the soil from year to year. The symptoms are briefly described, and various suggestions given for possible means of combating the disease. The author believes it is what is known in this country as sore shin, but the rapid wilting of the plant seems to indicate that it differs from that disease as usually described.

A disease of potato stems in Ohio, due to Rhizoctonia, A. D. SELBY (*Abs. in Science, n. ser., 16 (1902), No. 395, p. 138*).—For some time past investigations have been in progress at the Ohio Experiment Station upon the Rhizoctonia disease of potatoes. During June of 1902 a well-marked outbreak of this disease was reported at several points within the State. The affected plants show local areas of decay, both above and below the soil line. The most striking feature of the disease is the characteristic rosette aspect of the central leaves of the plants attacked. By the slight incurling of the leaves the affected plants may be readily recognized. This characteristic seems to be quite constant to a number of varieties.

Observations on the foot disease of wheat, L. MANGIN (*Jour. Agr. Prat., n. ser., 4 (1902), No. 36, pp. 306–308*).—Notes are given on a disease of wheat to which the name "piétin" is given. This disease has been known in France for more than half a century, and has recently been ascribed to attacks of *Ophiobolus graminis*, which is said to occur as a parasite on the wheat plant quite near the ground. Associated with this fungus are others, of which *Leptosphæria herpotrichoides* is the most common. The author has conducted a number of experiments to determine the parasitism of these fungi, and both were found to be parasitic, but their rôle in the development of the disease is quite independent. The Ophiobolus, only in exceptional cases, causes the lodging of the grain, while on the other hand the Leptosphæria is quite commonly the cause of the breaking down of the plants. Suggestions are given for the prevention of these diseases, the principal means being the treatment of the seed with fungicides and the selection of resistant varieties, the latter method seeming to offer the most satisfactory results.

The results of the hot water treatment of oats and spring wheat for smut prevention, H. ROMMETIN (*Jour. Agr. Prat., n. ser., 4 (1902), No. 39, pp. 407, 408*).—A brief note is given on the effect of hot water treatment on the eradication of oat smut. In fields which had from 8 to 12 per cent of their spikelets attacked by disease, when this seed was treated with hot water and sown, less than 1:10,000 of the plants were found to be infected.

A bacterial soft rot of certain cruciferous plants, H. A. HARDING and F. C. STEWART (*Science, n. ser., 16 (1902), No. 399, pp. 314, 315*).—For a number of years the writers have had under observation a soft rot of certain cruciferous plants, particularly of cabbage and cauliflower. During epidemics of black rot, due to *Pseudomonas campestris*, there is often much damage done by soft rot, and at first the disease was supposed to be a virulent form of black rot. Subsequently there were found several attacks of soft rot where there was little or no black rot, and this led to a further study of the cause of the disease.

From cauliflower beds which were severely attacked the writers isolated an organism which has been secured in pure cultures and inoculated into cabbage and cauliflower plants, producing the typical form of the disease. Cabbage and cauliflower plants inoculated between March 10 and June 17, with one exception, became rotten at the point of inoculation, while check plants showed no disease or discoloration. The extent of the rotting seems to be dependent upon the condition of the plant. On young, thrifty plants it progresses with great rapidity, while on old, woody, slow growing plants the signs of inoculation do not appear for several days, and in the majority of cases such plants are only checked in growth.

Cabbage and cauliflower leaves inoculated in the petioles usually become broken down at the point of inoculation within 48 hours. Young plants of kohl-rabi and Brussels sprouts were successfully inoculated in the stem, ruta-bagas in the leaf petioles, and radish and flat turnip by inoculation in the fleshy roots. The organism was tested on a large number of different kinds of plants, and from present indications it is believed that it is one of a group of organisms closely related to *Bacillus carotovorus*, which has been described as occurring on carrot and other plants (E. S. R., 13, p. 362).

In addition to the cruciferous plants it was found that *Amorphophallus simlense*, an araceous plant, frequently cultivated by florists, was subject to destructive injury when its petioles were inoculated with the organism.

A preliminary note on a new organism producing rot in cauliflower and allied plants, F. C. Harrison (*Science, n. ser., 16 (1902), No. 395, p. 152*).—During the summer of 1901 the author's attention was drawn to a disease of cauliflowers occurring in the vicinity of Guelph, Ontario. The plants, which were well grown, showed symptoms of rotting, the interior of the stem and often the flowering or edible part being changed into a dark-colored, soft mass. An examination of the material revealed the presence of enormous numbers of bacteria, and the casual organism was isolated and its relation to the rot established by inoculation experiments. The characteristics of the organism are briefly outlined, and in its action it is said to be similar to that described by Potter as attacking some other cruciferous plants (E. S. R., 13, p. 467). The name proposed for the organism is *Bacillus olereaceæ*.

Club root of cabbage, L. Mangin (*Rev. Hort.* [*Paris*], *74 (1902), No. 18, pp. 432–435, figs. 5*).—A description is given of the club root of cabbage, turnips, cauliflower, and other cruciferous plants, which is due to attacks of *Plasmodiophora brassicæ*. The organism is described in its various stages and the results of attempts to control the disease are given. The author recommends the rotation of crops wherever possible and the treatment of the soil with lime or phosphatic slag when rotation is not practicable. The débris of diseased plants should be collected and burned.

The banana disease, G. P. Foaden (*Jour. Khediv. Agr. Soc. and School Agr., 4 (1902), No. 3, pp. 117–119*).—An account is given of a disease of banana which is said to exist extensively in Fiji, and in connection with the recently described banana disease in Egypt it is of particular interest to that country. The outer leaves of the affected plants soon after they are set begin to turn brown and die, followed in a similar manner by the succeeding leaves. This continues for a considerable time, and instead of the plants attaining a height of 6 to 12 ft. they are greatly stunted and produce no fruit. An examination of these plants showed the presence of great numbers of aphids about the root stocks. In addition, the root stocks are infested with a fungus, the exact nature of which is not known. The tissues are discolored wherever the fungus is found. Great numbers of nematodes are found about the diseased plants, and the author believes that they have some part in the infection. Rotation of crops, deep cultivation with occasional subsoiling, and care in the selection of suckers for planting are recommended as means for the prevention of this disease.

Bitter rot of apples, T. J. Burrill and J. C. Blair (*Illinois Sta. Bul. 77, pp. 351–366, figs. 14*).—In continuation of the statement previously given (E. S. R., 14, p. 367), the authors present additional data relating to the distribution of the bitter rot of apples. This disease is one of the most destructive to which the apple is subject, and it is said that in 4 counties in 1900 it occasioned a loss of a million and a half dollars' worth of fruit. The appearance of the disease upon the fruit is described and notes given on the way in which the fungus passes the winter. It has been usually considered that it was carried over winter solely in old diseased apples which dry up and remain for some time upon the trees. In certain investigations all the mummy fruit was removed; but the disease was still present. In July a cooperator of the station, R. A. Simpson, of Vincennes, Ind., called attention to the distribution of the disease in cone-shaped areas in the trees, the earliest infection being traceable to an old rough wound on the branches. A few days later another individual reported the same fact, and this led to a microscopic study of material which confirmed the connection between the cankered places on the limbs and the disease upon the fruit. Later inoculation experiments with spores from cankers produced typical bitter rot on the fruit in 4 days. It is therefore evident that the disease on the apples could come from these canker spots on the branches, and it is probable that except in a few cases the first or early infection comes solely from these canker spots and not from the mummy fruit. The appearance of the bitter rot canker is described at some length and preventive measures are suggested. During the winter time the mummy fruits and cankers should be removed, or the fungus could probably be destroyed by spraying the trees with a solution of copper sulphate. The disease can be kept in check during the summer by repeated applications of Bordeaux mixture.

Pear blight in California, N. B. Pierce (*Science, n. ser., 16 (1902), No. 396, pp. 193, 194*).—Pear-leaf blight, although doubtfully reported in California for many years, was observed in a typical form in southern California in 1899. The disease assumed its normal epidemic form and spread over several counties in a short time, occasioning great damage. In the spring of 1900 it had developed seriously in a number of widely separated regions, and is reported as occurring to a considerable extent in the leading pear growing districts of southern California, and of the San Joaquin and Sacramento valleys. It has hitherto been believed that the atmospheric conditions in the hot interior valleys of California would be detrimental to the destructive development of pear blight, but the facts presented are quite to the contrary.

In California there are said to be 2 distinct forms of the disease, a spring and summer form, likewise a winter epidemic, the latter form being by far the more destructive. The winter form of disease, which by inoculation experiments has been proved identical with the spring form, has some distinguishing characteristics. It seldom or never attacks the tree at points higher than a man's head, always affecting the trunk or base of the main limbs, and the infection takes place about the time the crop is gathered or shortly after, continuing active and destructive during the months of November, December, and January. It may also occur in orchards which have shown little or no signs of the spring form of the disease.

The infection usually occurs in the short spurs developed upon the base of the main limbs or on the trunk of the trees. These spurs not infrequently develop clusters of flowers late in the fall, and seldom occur more than 5 or 6 ft. from the ground. The winter temperature is sufficiently warm to permit the blight bacillus to grow, and as the affected parts can not be removed by pruning without detriment to the tree, the winter development has resulted in more serious injury and greater losses of trees than the spring form of the disease in the East. In the winter blight, as well as the spring form, the growing tips of purely vegetative shoots occasionally serve as points of infection. This has been shown possible by the visit of bees which are attracted to the buds for the deposit of glue or wax which occurs on the winter buds. The agency of bees in distributing the pear blight is shown by statements regarding the serious affection of a number of orchards near large colonies of bees.

Notes on canker and black rot, P. J. O'Gara (*Science, n. ser., 16 (1902), No. 402, pp. 434, 435*).—During the summer of 1901 several specimens of sumac (*Rhus glabra*), occurring on the campus of the University of Nebraska, were found affected with the canker caused by *Sphæropsis rhoina*. During the summer of 1902 experiments were carried on to determine whether this fungus and the *S. malorum* occurring on the apple may not be the same. Pure cultures of each were made and their behavior was identical in every particular. Sound apples inoculated with spores, on the fourteenth day after inoculation, were blackened and densely dotted with the protruding pycnidia. Spores obtained from the inoculated apples were used to inoculate healthy branches of both the apple and sumac, and so far no differences can be observed in the growth of the different species. The experiment seems to establish that *S. rhoina* will cause the black rot on the fruit of the apple, and will also produce the typical canker on the branches and limbs just as readily as *S. malorum*. Although the evidence is not yet complete, it is believed that the 2 species are identical.

The gray rot of grapes, R. Roger (*Jour. Agr. Prat., n. ser., 4 (1902), No. 39,* *p. 411*).—A brief account is given of the gray rot of grapes, due to *Botrytis cinerea.* The author recommends the removal of the leaves in such a way as to secure a better circulation of air about the plant and the consequent evaporation of moisture, and dusting the plants with a powder composed of 90 per cent gypsum and 10 per cent copper sulphate, or 80 per cent gypsum and 20 per cent neutral verdigris.

Diseases of the hardy catalpa, H. VON SCHRENK (*U. S. Dept. Agr., Bureau of Forestry Bul. 37, pp. 49–58, pls. 8, figs. 2*).—After describing the durability of the catalpa timber, the author considers some of the diseases to which this tree is subject. As a rule, the hardy catalpa is free from destructive diseases. The leaves are sometimes attacked by parasitic fungi which seldom occasion any material injury. The young twigs so far as known are seldom attacked by any fungus, and root diseases are likewise unknown. Under unfavorable conditions, however, there are 2 fungus diseases which destroy the wood of the trunk: One, a soft rot, caused by *Polyporus versicolor*, which destroys the heartwood of the catalpa very rapidly after it has once gained entrance; and a second disease, known as the brown rot, which is due to a new species of fungus to which the name *P. catalpæ* is given. The young shoots and leaves of the catalpa sometimes suffer from an apparent blight, in which the leaves and buds turn black, shrivel, and fall from the tree. This trouble seems to be widely distributed, and is due to the presence of the larvæ of one of the gall gnats.

Notes on some diseases of western conifers, H. VON SCHRENK (*Abs. in Science, n. ser., 16 (1902), No. 395, p. 138*).—The coniferous trees of the Pacific Coast and adjoining regions are said to be attacked by a number of fungus diseases, some of which destroy as much as 40 per cent of the standing timber. The more important diseases are caused by *Trametes pini, Polyporus schweinitzii, P. libocedris* n. sp., *Echinodontium tinctorum*, and *Polyporus officinalis.* The development of these fungi and the manner and extent to which they destroy wood are described.

The prevalence of Alternaria in Nebraska and Colorado during the drought of 1901, G. G. HEDGCOCK (*Abs. in Science, n. ser., 16 (1902), No. 395, pp. 136, 137*).—A report is given of the observations made by the author in various sections of Nebraska and Colorado during the period of severe drought in July and August of 1901. The conditions which existed seem to have retarded the development of such fungi as Cercospora and Phyllosticta, but favored the growth of Alternaria, the leaves of such plants as sugar beets, potatoes, pumpkins, cantaloupes, and plantains being severely blighted.

Sclerotinia fructigena, J. B. S. NORTON (*Abs. in Science, n. ser., 16 (1902), No. 395, p. 137*).—According to the author, previous studies of this destructive fruit disease have been confined to the conidial stage. He reports having found the apothecia abundantly on buried peach and plum fruits, which are described at some length. The cycle of development of the fungus is completed in a few days, and the connection between the apothecia and monilia form was demonstrated by laboratory cultures. On account of the formation of the fruiting organs on the buried fruits, the author states that diseased fruits should be burned or otherwise destroyed.

Arachniotus trachyspermus, a new species of the Gymnoascaceæ, C. L. SHEAR (*Abs. in Science, n. ser., 16 (1902), No. 395, p. 138*).—A description is given of the above fungus, which has been isolated in diseased cranberries grown in New Jersey. The fungus appears to be undescribed and, so far as known, not hitherto reported in the United States.

The finding of Puccinia phragmitis in Nebraska, J. M. BATES (*Abs. in Science, n. ser., 16 (1902), No. 395, p. 138*).—The author reports finding the æcidial stage of this fungus on the garden rhubarb in 1901, and the following year upon different species of Rumex occurring at a number of localities. This completes the life history of the fungus, which is believed to be new to this continent.

North American Ustilagineæ, G. P. CLINTON (*Jour. Mycol., 8 (1902), No. 63, pp.*

128–156).—Notes are given on studies made by the author during the past 2 years, which are preliminary to a monograph of the Ustilagineæ of North America which he hopes to issue in the near future.

Notes on some West American fungi, P. L. RICKER (*Jour. Mycol., 8 (1902), No. 63, pp. 125–128, fig. 1*).—Notes and descriptions are given of a number of fungi which were collected in Wyoming and Idaho during 1901, together with a number of specimens found on grasses in the herbarium of this Department.

Plant pathological stations in Northern Europe, E. MARCHAL (*Bul. Agr.* [*Brussels*], *18 (1902), No. 1, pp. 45–53*).—A description is given of a number of plant pathological laboratories in Germany, Sweden, Denmark, and Holland which were visited by the author.

ENTOMOLOGY.

Proceedings of the fourteenth annual meeting of the Association of Economic Entomologists (*U. S. Dept. Agr., Division of Entomology Bul. 37, n. ser., pp. 127, pl. 1, figs. 2*).—At this meeting, held in Pittsburg, Pa., June 27 and 28, 1902, the following papers were read:

On the study of forest entomology in America, A. D. Hopkins (pp. 5–28).—This is the address of the retiring president, and contains notes on the present status of the study of forest insects in America, together with an account of some of the more serious outbreaks among the forest insects during recent years. A summarized statement is presented, showing some of the practical results of forest entomology.

Notes on the use of the lime-sulphur-and-salt and the resin washes in Ohio, A. F. Burgess (pp. 33–35).—Fruit trees sprayed with lime-salt-and-sulphur wash on December 31 were inspected on the following May 24, when it was found that about 98 per cent of the scales had been destroyed. This wash was also applied by several orchardists during March with satisfactory results. One case of apparent injury to peach twigs was observed on Catawba Island. Resin wash applied January 8 apparently destroyed all the scales, as judged by an examination made May 24. Similar experiments were made by fruit growers with this wash, with satisfactory results.

Experimental work in New York State against the San José scale, E. P. Felt (pp. 35, 36).—Excellent results in the destruction of the San José scale were obtained from the use of a 20 per cent mechanical mixture of crude petroleum; potash whale-oil soap, 2 lbs. to the gallon of water; tobacco whale-oil soap, 2 lbs. to the gallon of water; and linseed oil, either raw or boiled. No decided injuries were caused to any of the trees, except from the use of the linseed oil.

Report of experiments with lime-salt-and-sulphur wash against the San José scale in Maryland, A. L. Quaintance (pp. 37–40).—Applications of lime-salt-and-sulphur wash were made in 3 localities. Five-year-old plum trees were treated on March 4, and when examined later it was found that the treatment had not given satisfactory results. Two-year-old peach trees treated on March 27 and 28 were not injured by the application, but it appeared that only from 45 to 50 per cent of the scales were killed. Other peach trees treated on March 22 remained uninjured and the effectiveness of the application was much greater, about 98 or 99 per cent of the scales being killed.

Some practical experiments with various insecticides for the San José scale in Georgia, W. M. Scott (pp. 41–51).—Abstracted from another publication (see p. 589).

Soluble arsenic in arsenical insecticides, J. K. Haywood (pp. 51–54).—An examination of samples of Paris green showed that an excess of free arsenic may be due to the decomposition of Paris green in contact with water, to a fine pulverization of the Paris green, or to its being originally added to the material. In determining the soluble arsenious oxid in Paris green it is recommended that 1 part of the Paris green be extracted with 1,000 parts of water for 10 days. All samples of London purple examined by the author showed the presence of more than 4 per cent free arsenic.

Résumé of the search for the native home of the San José scale in Japan and China, C. L. Marlatt (pp. 65–78).—Detailed notes are given on the itinerary of the author through Japan and China. Arguments are presented to show that Japan is not the native home of the San José scale. In China the scale was found on native crab-apples and haws and the author believes that the evidence for the origin of the scale in China is very good. It is suggested that the scale may have been carried from China to California on trees imported by James Lick.

Preliminary report on the importation and present status of the Asiatic ladybird, C. L. Marlatt (pp. 78–84).—Notes are given on the shipments of *Chilocorus similis* made by the author into this country, as well as upon previous importations into California by A. Koebele and into New Jersey by J. B. Smith. The beetles appear to be thriving well in this country, and it is believed that much may be expected from them in the future in the way of destroying the San José and other scales.

Predatory insects which affect the usefulness of scale-feeding Coccinellidæ, C. L. Marlatt (pp. 84–87).—Observations on ladybirds have shown that they are destroyed by the wheel bug, the native and introduced species of praying mantis, lace-winged flies, and by *Adalia bipunctata*. The wheel bug is considered to be a source of the greatest menace to the introduced ladybird larvæ. A parasite, *Syntomosphyrum esurus*, has also been bred from the introduced ladybirds, but as this species belongs with a group of secondary parasites, it is suggested that the primary parasite may prove to be *Homalotylus obscurus*.

On the feeding habits of the adults of the periodical cicada, A. L. Quaintance (pp. 90–94).—Observations made by the author indicate clearly that both sexes of the periodical cicada puncture trees of various species and suck out the sap. These feeding habits were observed in a number of localities in Maryland, and the trees upon which the cicadas were observed include apple, pear, peach, plum, maple, oak, etc. The beak of the cicada was introduced into the wood for some distance while feeding, and when the insects were captured in the act of feeding and quickly opened it was found that the alimentary tract was considerably distended with sap.

Notes from Delaware, E. D. Sanderson (pp. 97–102).—The author presents a brief account of the various species of plant lice on apples, and means for combating them, as well as on the strawberry-root louse, codling moth, periodical cicada, strawberry weevil, and *Systena tæniata*.

Notes for the year in New York, E. P. Felt (pp. 102, 103).—Brief statements concerning grape-root worm, grapevine leaf-hopper, apple-tree tent caterpillar, forest tent caterpillar, and fall webworm.

Observations on certain insects attacking pine trees, E. P. Felt (pp. 103–105).—Notes on *Tomicus calligraphus*, *T. pini*, *Monohammus confusor*, and *Dendroctonus terebrans*.

Egg-laying record of the plum curculio, A. L. Quaintance and R. I. Smith (pp. 105–107).—Observations were made on the laying habits of plum curculios, during which it was found that the largest number of eggs deposited by any single beetle was 436.

Notes from New Mexico and Arizona, T. D. A. Cockerell (pp. 107–109).—Brief notes on *Parlatoria blanchardi*, box-elder plant louse, *Clisiocampa constricta*, and a number of beetles.

A partial list of the Coccidæ of Ohio, F. M. Webster and A. F. Burgess (pp. 109–113).—The authors present a list of 71 species of Coccidæ, with a statement of the food plants upon which they were found.

Observations upon the mosquito, Conchyliastes musicus, H. A. Morgan (pp. 113–115).—The female of this species is said to attack mammals furiously, and to cause swellings on man as a result of its bites. The larvæ are active at the surface of the water for the first 24 hours, after which they may remain at the bottom for at least 47 minutes without coming up for air. Notes are given on other points in the life history of this species.

Some notable insect occurrences in Ohio for first half of 1902, H. Osborn (pp. 115, 116).—Notes are given on clover-leaf weevil, chinch bugs, cankerworm, horn fly, fall webworm, and periodical cicada.

Report of the entomologist, J. B. SMITH (*New Jersey Stas. Rpt. 1901, pp. 463–587, figs. 36*).—This report contains, as usual, a general account of the insect depredations in New Jersey during the year. Notes are given on the prevalence and means of combating fall webworm, white-spotted tussock moth, catalpa sphinx, tomato hawk moth, swallow-tail butterflies, plant lice on currant, apple, strawberry, cherry, maple, plum, hickory, and pea, and various scale insects. The author had good success in the use of arsenate of lead in destroying fall webworm. Notes are given on the damage caused by the destructive pea louse and on experiments with machines specially devised for destroying this insect. Most of the experiments were made with potash whale-oil soap, 1 lb. to 6 gal. of water. This remedy proved effective and perfectly harmless to the plants. Among various kinds of scale insects mention is made of oyster-shell bark-louse, tulip soft scale, rose scale, and San José scale. The extension of the latter insect is said to be slower at present than in former years. It is not considered a menace to shade and forest trees. Crude petroleum is considered the best remedy, while lime-sulphur-and-salt wash was used with excellent success. Notes are also given on shade tree insects (including elm-leaf beetle, wood leopard moth, bagworm, and an undetermined maple-leaf stalk borer); orchard insects (including rosebugs, silky June beetles, plum curculio, sinuate pear borer, pear midge); and also on Hessian fly, angoumois grain moth, rhubarb beetles, asparagus beetles, tortoise beetles, potato beetles, cranberry insects, mosquitoes, and *Ligyrus relictus* said to be injurious in a larval stage upon the roots of pyrethrum. Experiments were made with a number of insecticides, including arsenate of lead, whale-oil soap, tobacco extract, Yankee Yellow, Pyrox, Hammond's Thrip Juice, Kretol, and petroleum. Whale-oil soap did not prove a successful remedy as a winter treatment of San José scale. The results obtained with this insecticide in summer were very satisfactory. The author gives a detailed report of some operations with crude petroleum as an insecticide. It is believed that this material is the best insecticide for use against San José scale. The preferred period for application is just previous to the beginning of growth in the spring.

Notes are given on 2 introduced beneficial insects, *Tenodera sinensis* and *Mantis religiosa*. Eggs of these insects were introduced into New Jersey, but it is not known at present whether the insects have been successfully established in the State. The author refers briefly to the miscellaneous work of his department and to the insects mentioned in the crop bulletins in New Jersey. An investigation was made of injury to cranberries by the cranberry katydid, *Scudderia texensis*. A number of experiments were made in testing the value of fungus diseases in destroying this insect. In experiments made on cranberry bogs it was found that the eggs of this insect were often laid in the leaves of *Panicum dichotomum*. It is not certain whether the eggs can survive the winter underneath the cranberry bogs in such situations. Notes are given on the habits and life history of the insect. It is concluded that no reliance can be placed on fungus diseases of this insect, or on insecticides, or the cooperation of turkeys and other fowls. It is recommended that the underbrush and rubbish on the ground surrounding the bogs be burned annually. This can perhaps be best accomplished by the use of the cyclone burner, such as was employed by the Gypsy Moth Commission.

The author presents a detailed account of the mosquitoes in New Jersey, including a discussion of their prevalence and means of distribution, the species concerned, and the results which have thus far been accomplished in the investigation of means for exterminating them. Circular letters were sent to various parts of the State for the purpose of determining the distribution of mosquitoes. The author states that while Anopheles may be one means of transmitting malaria from one person to another, another factor thus far unknown is required in the transmission of the disease. Detailed notes are given on the various species of mosquitoes found in New Jersey, and upon their breeding habits and means of spreading from one part of the State to another.

Report of the botanist and entomologist, G. W. Herrick (*Mississippi Sta. Rpt. 1902, pp. 31–33*).—Brief notes on mosquitoes, pecan insects, chicken lice, Colorado potato beetle, peach-tree borer, San José scale, and fumigation with hydrocyanic-acid gas and Nicoticide.

Winds and storms as agents in the diffusion of insects, F. M. Webster (*Amer. Nat., 36 (1902), No. 430, pp. 794–801*).—Brief popular notes on the influence of winds and thunderstorms upon the habits and diffusion of insects.

Flowers and insects in New Mexico, T. D. A. Cockerell (*Amer. Nat., 36 (1902), No. 430, pp. 809–817*).—Notes on the insect visitors of a number of flowers in different parts of New Mexico.

Injurious insects, E. Fleutiaux (*Agr. Prat. Pays Chauds, 2 (1902), No. 8, pp. 229–234*).—Brief notes are given on the habits and life history of *Brachytrupes membranaceus*, which causes serious damage to coffee trees in Madagascar; *Centrinus sipolisi*, injurious to the custard apple; *Corcyra translineella*, which attacks the seeds of sesame. A brief list is given of insects collected along the Mouni River.

Injurious insects observed in Ireland during the year 1901, G. H. Carpenter (*Econ. Proc. Roy. Dublin Soc., 1 (1902), III, No. 5, pp. 132–160, pl. 1, figs. 27*).—Detailed notes are given on the life history and injuries caused by the sheep-fly (*Lucilia sericata*). Observations show that this fly deposits its eggs in clusters of about 50 in the wool of the sheep, and that heavy wooled fat sheep, especially such as are in an uncleanly condition, are most liable to attack. The insect may irritate the skin so extensively as to cause great loss of flesh, or death in some instances. Ordinary sheep dips are not effective in destroying this insect, but constant use of sulphur or lime dust and frequent examination of the wool will serve to prevent serious injury.

Notes are given on *Phyllotreta nemorum* injuring turnips, cabbage-root maggots, diamond-back moth, frit fly, bean weevil, pea weevil, ground beetles, pear thrips, and a number of other injurious insects. For combating injurious ground beetles poisoned bait in tin dishes is recommended.

Insects injurious to fruit and vegetables, H. T. Fernald (*Trans. Massachusetts Hort. Soc. 1901, I, pp. 141–143*).—A general account of the extent of injuries due to insects with special reference to the ravages of the San José scale.

Inspection of fruits and plants; orchard notes for August, G. Quinn (*Jour. Agr. and Ind. South Australia, 6 (1902), No. 1, pp. 25–29*).—A brief description is given of the inspection system which is in force in South Australia, and notes are presented on the time of appearance of several important injurious insects, together with recommendations of treatment.

Insects injurious to fruit trees, H. Faes (*Chron. Agr. Canton Vaud, 15 (1902), No. 15, pp. 449–459, figs. 6*).—Notes are given on the habits, life history, and means of combating woolly aphis, apple aphis, plum aphis, peach aphis, various species of scale insects, including oyster-shell bark-louse, peach scale. San José scale, and *Grapholitha funebrana*.

Suggestions for controlling the importation of insect pests, H. Maxwell-Lefroy (*West Indian Bul., 3 (1902), No. 2, pp. 140–150*).—The author classifies the various insect pests known in the West Indies into groups arranged according to the degree of damage caused by the insects. Scale insects, of which 120 species are known in the West Indies, are arranged in 3 classes, considered as very destructive, moderately destructive, rare and harmless, respectively. Among these species the great majority of very destructive species have been introduced from various foreign sources. Notes are given on the insects which are likely to be introduced and on the means of distribution of injurious insects among the West Indian Islands. The author recommends the prohibition of special importations, the destruction of infested plants upon arrival, and the treatment of all imported plants by fumigation or some other method.

Certain leaf-eating caterpillars of the sugar cane, W. van Deventer (*Meded. Proefstat. Suikerriet West Java, 1902, No. 56, pp. 12, pl. 1*).—Descriptive notes are given on *Pamphila augias, Hesperia philino, H. mathias,* and *H. conjuncta.*

Cane borer (Diatræa saccharalis), W. C. Stubbs and H. A. Morgan (*Louisiana Stas. Bul. 70, 2. ser., pp. 885–927, figs. 11*).—Notes are given on the history of this insect in the Southern States and its general distribution. Circular letters were sent to cane growers in the various parts of the State, the replies to which indicate that the borer is at present distributed chiefly in the parishes of Assumption, Ascension, and Iberville on the east and west banks of the Mississippi. Various remedial measures are practised by the cane growers, but the most effective one is burning all of the trash. The details of the life history of this insect were worked out in both cane and corn, the 2 most important food plants of the species. It was found that the larvæ which emerge from eggs in November do not pupate until the following March or April, while in July the larval period is usually from 25 to 28 days. This prolongation of the larval period is of considerable importance in combating the insect. The pupal condition is always spent in the cane stalk. About 87 per cent of the moths appear before April 15. In the corn plant the borers destroy the terminal leaves. It is believed by the authors that the corn plant is largely responsible for the increase of the sugar-cane borer in the State.

In combating this insect it is important to remember that the moths can not escape from buried cane; the borer, therefore, can not increase its distribution from fall-planted cane, unless the tops are left upon the ground undestroyed. The windrowing of canes is condemned as a practice which allows the extensive distribution of the insect. The cane tops or other material in which the borer may be found should either be buried or burned. During the author's experiments 100 stalks of cane were buried at different depths, varying from 6 in. to ½ in. The results indicate that in some soils many of the borers died and that the moths were unable to escape, even when the cane was buried to a depth of ½ in. It is recommended that neither corn nor a second crop of sugar cane be planted on windrowed ground until the borers have been eradicated. The cutting out of infested stalks of corn and cane may be accomplished without any great expense. In one instance 2,000 acres were thus treated at an expense of $170. The chief natural enemies of the sugar-cane borer are the larvæ of *Chauliognathus marginatus* and *Drasterius elegans;* ants and an unidentified white fungus have also been observed attacking this insect.

The turnip sawfly and injuries caused by this insect in the vicinity of Paris in 1901, P. Marchal (*Ann. Min. Agr.* [*France*], *21* (*1902*), *No. 2, pp. 295–304, figs. 2*).—Descriptive biological and economic notes are given on *Athalia spinarum.* The insect is injurious to all cultivated members of the mustard family and to various wild species of this family. In the adult stage it lives not longer than 15 days. The injury is caused by the larvæ, which skeletonize the leaves. There are 2 generations per year, the first generation of adults appearing in May and the second in August. This species of sawfly is found in England, Continental Europe, and as far east as Japan. It has appeared in large numbers, causing unusual destruction at various times. The invasion of 1901 was attended with great destruction to cruciferous plants. In some localities crows are useful in destroying this insect. A number of other birds, particularly ducks, feed upon the insect. It is also attacked by various parasites and by a bacterial disease. The remedies which are recommended for controlling it include spraying with kerosene emulsion, rape-seed oil, powdered lime, and the use of trenches and brushes, as well as collection of the adult insects and rotation of crops.

The fruit fly, J. Lindsay (*Queensland Agr. Jour., 11 (1902), No. 1, pp. 21-23*).—In combating the attacks of the fruit fly upon oranges the author had the best success in collecting a few of the oranges which first ripened and placing them on the ground near the tree, smearing them with some preparation like "tanglefoot" used for catching flies. The oranges thus treated are placed in position in the evening, and the observations made by the author indicate that flies in attempting to oviposit in the oranges are captured in large numbers.

Winter treatment of the San José scale in the light of recent experiments, W. M. Scott and W. F. Fiske (*Georgia State Bd. Ent. Bul. 4, pp. 32, pls. 2*).—During the past winter over 500,000 trees in Georgia were sprayed with petroleum oils in some form. A number of other insecticides, including whale-oil soap, lime-salt-and-sulphur wash, crude caustic potash, etc., were used and notes are given on the results of the experiments with these insecticides. The experiments were confined to peach trees and were conducted in 2 orchards containing 17,000 trees 2 years of age and 200,000 trees 4 years of age respectively. In one orchard only about 10 per cent of the trees were free from the scale, while in the other about 25 per cent were badly infested. Insecticide work was begun on November 30 and was continued at intervals during December, January, February, and up to March 7. Several kinds of oil were used, including Pennsylvania crude oil, refined kerosene, Ohio crude oil, and California distillate. From the extensive experiments carried on by the authors it appears to be impossible to decide definitely as to the comparative merits of kerosene and crude oil. They are considered the 2 best remedies, good results having been obtained from 2 applications of either one, at a strength not lower than 15 per cent. The results appear to be slightly in favor of the effectiveness of crude oil. Two applications proved much more effective than one. In many cases 1 application was quite inadequate while 2 applications, even of weaker solutions, were very effective. A comparison was made between fall and spring spraying. It was found that a greater proportion of the scale was killed on trees sprayed in the spring than on those sprayed in the fall or winter. There are, however, many strong and obvious advantages in favor of treatment in the fall. A careful comparative test was made of a mechanical mixture of oil and soap emulsion. As a result of this test it is stated that, all things considered, the oil may be applied as cheaply and with less trouble in the form of emulsion than in the form of mechanical mixtures.

Tests were made of different strengths of oil, including 10, 15, 20, and 25 per cent solutions. It was found that a 25 per cent solution is required for young, healthy, infested orchards, while 2 applications of a 15 per cent solution proved effective in older orchards.

Observations made for the purpose of determining the influence of the weather on spraying gave only negative results. No apparent influence of the weather was determined. The Ohio crude oil was used on several plats of trees with good success. California distillate, at strengths of 10, 15, and 20 per cent, was sprayed on 200 trees, with no better results than those obtained from ordinary oils.

Whale-oil soap was used in solutions of 1½ and 2 lbs. to the gallon of water. The weaker solution was found to be unsatisfactory, even in 2 applications, while a single spraying with a solution of 2 lbs. to the gallon was very effective. None of the applications of whale-oil soap made during the fall and winter were successful. The experiments indicate that whale-oil soap should be applied in the spring as late as possible before the blossoms open. A single application of potash soap, at the rate of 2 lbs. to the gallon of water, under good conditions, gave as good results as single applications of a 25 per cent strength of kerosene or crude oil, either in mechanical mixture or in an emulsion. The general effect of whale-oil soap on trees was apparently beneficial, with 1 exception. The lime-salt-and-sulphur wash was carefully tested. The effect of this insecticide on the scales was not at once apparent, but the ultimate results were as satisfactory as those obtained from 2 applications of kerosene emulsion. This insecticide is considered equal to any treatment, except 2 applications of kerosene or crude oil. The cost of the material for lime-salt-and-sulphur wash is much less than that of oil; the cost and trouble of preparation, however, is more than that of the oil emulsion. One test was made of resin wash, with poor results. It proved also to be a difficult matter to prepare this insecticide properly. Crude caustic potash was tested in solutions containing 5, 10, and 15 lbs. to 50 gal. of water. The weak solution was ineffective, but the 2 stronger ones gave good results. The trees were not injured by any of the solutions. Crude carbolic acid was tested in various forms, with unsatisfactory results in all cases.

In addition to the experiments already mentioned, 53 3-year-old peach trees and 1,000 plum trees were treated. Various strengths of kerosene and crude oil were used throughout the season in spraying these trees. The results were highly satisfactory. The trees bloomed and put out leaves in a normal manner and bore an excellent crop of fruit. The scale was perhaps as nearly eradicated as possible. Notes are given on the methods of preparing oil emulsion, lime-salt-and-sulphur wash, whale-oil soap, and crude caustic potash.

The codling moth, G. QUINN (*Jour. Agr. and Ind. South Australia, 6* (*1902*), *No. 2, pp. 110–114*).—A circular letter was sent to a number of prominent apple growers in Tasmania for the purpose of securing statements concerning the effectiveness of measures which had been adopted in controlling the codling moth. The majority of the fruit growers express the opinion that governmental inspection is necessary for effective work in controlling this insect. Attention is called, however, to the necessity of conscientious work on the part of the inspectors.

Spraying tests for the codling moth, G. QUINN (*Jour. Agr. and Ind. South Australia, 6* (*1902*), *No. 1, pp. 19–21*).—A series of experiments were undertaken for the purpose of determining a suitable method for combating this insect. The trees were sprayed at intervals of 2 weeks, beginning immediately after the fall of the petals. The insecticides used were Paris green, 1 oz. to 10 gal. limewater (made by slaking 1 lb. of fresh lime); and arsenite of soda (made by boiling 1 lb. of white arsenic and 2 lbs. of soda crystals in 1 gal. of water, which was then diluted at the rate of 1 pt. in 40 gal. of limewater). Different blocks of trees were sprayed 4, 5, 6, and 7 times respectively with Paris green. These blocks showed 89, 93, 94, and 83 per cent of apples respectively free from codling moth. In the 4 rows which were not sprayed 57 per cent of the apples were free from codling moth, while on 4 rows which were sprayed 5 times with arsenite of soda 94 per cent were free from attack.

The peach worm, W. T. CLARKE (*California Sta. Bul. 144, pp. 44, figs. 20*).—The peach worm (*Anarsia lineatella*) is said to be the most serious insect pest of the peach of California, where the damage in some seasons amounts to 30 per cent of the entire crop. The insect is known under the names bud worm and fruit worm, according to the part of the peach tree which it injures at different seasons of the year. The author's experiments were made on 200 acres of peach trees of different varieties containing about 12,000 trees, and these experiments were duplicated on a smaller scale in many other localities. During the winter the insect hibernates in a burrow within the bark in the crotches of the tree where the new wood joins that of the previous year. The burrow is always on the upper side of the crotch. The insect is not attacked by parasites during the hibernation period to any appreciable extent. The distribution of these winter burrows of the species was found to correspond with the extent to which old infested peaches had been thrown around the trees as a fertilizer. This custom is condemned as responsible for spreading the insect. It was found that pruning could not be depended upon for controlling this insect.

Spraying experiments were instituted on January 9 and were continued until the middle of the month. Kerosene emulsion of 2 strengths was used, but this insecticide appeared to have no beneficial effect. It was found by examining the larvæ in their winter burrows that the silk casing by which they were surrounded protected them against not only kerosene emulsion but distillate oil, lime-salt-and-sulphur spray, and other materials. No differences were noted between the sprayed and the unsprayed trees if spraying was performed during the winter. It was found necessary to wait until the larvæ became active in the spring. During the spring spraying experiments lime-salt-and-sulphur mixture, oils, emulsions, and I X L were used. The latter insecticide was used on 8,300 peach trees with very unsatisfactory results. The best results were obtained from the use of the lime-salt-and-sulphur mixture. The use of oils and emulsions, including the so-called Hercules emulsion made from distillate oil, caused more or less destruction of the blossoms and injury to the trees.

The larvæ remained in their burrows until early in March when they escaped and attacked the young growth, boring into the pith. This attack is more noticeable on young than on old trees. The larvæ remain in the buds and new twigs until the latter part of April. The larvæ seek the curled pieces of bark on the trunks and branches of the tree for pupation, the large proportion of the larvæ pupating low down on the trunk. Banding experiments showed that the larvæ did not prefer the bands to the curled pieces of bark. The moths appear in from 10 to 12 days and begin to lay their eggs about May 9 about the bases of the leaves. The larvæ from these eggs bore into the pith and remain as twig borers for about 20 days, when they leave the twigs and enter the fruit. The next generation exhibits a similar life history, while the larvæ from the third generation enter the bark in the crotches of the tree and pass the winter in this condition. For combating this insect the author recommends spraying with the lime-salt-and-sulphur compound just before the blossoms open, or even after the blossoms have opened.

Insects of the wattle trees, W. W. Froggatt (*Agr. Gaz. New South Wales, 13 (1902), No. 7, pp. 701–720, pls. 3*).—Certain species of the genus Acacia known as wattle trees in Australia are among the most important trees of that country. These trees are frequently damaged to a great extent by various species of insects, and in the present article the author has brought together descriptions of a large number of species of insects which injure these trees. The insects which are described include various species of beetles, moths, flies, scale insects, and other Homoptera. A number of the injurious species considered are well illustrated on plates.

The effect of Aphrophora salicis on willows, A. Jacobi (*Arb. K. Gesundheitsamte, Biol. Abt., 2 (1902), No. 4, pp. 513, 514*).—The author's observations were confined largely to the injurious effects of this insect upon *Salix alba*. It was found that where the insect was present in large numbers the leaves were greatly injured by the numerous punctures and the whole plant became stunted.

Felted beech coccus (*Jour. Bd. Agr. [London], 9 (1902), No. 2, pp. 218, 219*).—*Cryptococcus fagi* attacks chiefly the trunks of beech trees. It is recommended that infested trees be twice sprayed with strong kerosene emulsion, with an interval of 2 days between the applications.

Hydrocyanic-acid gas in greenhouses, H. C. Price (*Amer. Florist, 19 (1902), No. 750, pp. 405, 406*).—A number of tests were made with this substance in fumigating greenhouses for the destruction of injurious insects. It was found that plants were less injured by exposure for a short time to a large amount of gas than by a long exposure to a small amount of gas. The method of fumigating with dilute gas is therefore not recommended.

Fumigation under box covers, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 21 (1902), No. 1, pp. 54–64, figs. 4*).—The author briefly describes, in connection with illustrations, the more important box fumigators which have been constructed in different countries for use in combating the San José scale.

Ortel's traps for catching locusts, R. de Saint-Foix (*Bul. Agr. Algérie et Tunisie, 8 (1902), No. 14, pp. 343, 344*).—It was found that by sinking troughs into the soil and partly filling them with water covered with a film of oil the locusts could be induced to jump into the trough, provided a number were caught by other methods and thrown into the film of oil.

The fundamentals of spraying, A. V. Steubenrauch (*Pennsylvania State Dept. Agr. Bul. 93, pp. 35, pls. 10, figs. 4*).—Reprinted with slight changes of phraseology from Illinois Station Bulletin 68 (E. S. R., 13, p. 876).

Alphabetical index to North American Orthoptera described in the eighteenth and nineteenth centuries, S. H. Scudder (*Boston Soc. Nat. Hist., Occasional Papers, VI, 1901, pp. 436*).—In this paper the author has compiled a list of all known definite references to the Orthoptera of North America and the West Indies, from the time of Linnaeus to the close of the last century. The paper includes an alphabetical index of all the species arranged according to genera, and bibliographical references under each genus, a bibliographical list of all literature cited, and an index to the specific names mentioned in the paper.

The salt-marsh mosquito (Culex sollicitans), J. B. Smith (*Science, n. ser., 15 (1902), No. 401, pp. 391-394*).—The experiments and observations of the author on this insect show that the adult deposits its eggs singly in the mud of salt marshes above ordinary high tide where the sod is not too wet. The eggs may also be laid in other situations. They remain in the mud for an indefinite time until unusually high tide or heavy rain covers them with water; they then hatch within a few minutes and the larvæ feed on the decomposing mud. The larvæ seem to thrive well in both salt and fresh water.

Clothes moths (*Jour. Bd. Agr. [London], 9 (1902), No. 2, pp. 221, 223*).—Biological and economic notes are presented on *Tinea pellionella*, *T. bisselliella*, and *T. tapetzella*. The attacks of these insects may be prevented in large part by frequent removal and beating of clothes. Exposure to sunlight, the use of benzine, and cold storage at a temperature of 40° F. are recommended.

Furniture beetles (*Jour. Bd. Agr. [London], 9 (1902), No. 2, pp. 219-221*).—Notes are given on the habits and life history of *Anobium domesticum* and *Xestobium tessellatum*. As a remedy for these insects it is recommended that cracks of furniture be painted with a solution of corrosive sublimate, or that infested material be treated with benzine or carbolic acid. Fumigation with hydrocyanic acid, where practicable, is exceedingly effective.

Economy in bee keeping, E. Forrest (*Jour. Jamaica Agr. Soc., 6 (1902), No. 7, pp. 259-261*).—Attention is called to the necessity of keeping the hives and all equipment around the apiary in a clean condition in order to avoid diseases among the bees and to secure a better and more marketable grade of honey.

Apiculture and serotherapy, P. Robinet (*Rev. Internat. Apicult., 24 (1902), Nos. 6, pp. 133-137; 7, pp. 144-148*).—The anatomical details of the stinging apparatus of bees are carefully described and brief recommendations are made concerning means which may be adopted for avoiding bee stings. Natural immunity to the bad effects of bee stings is acquired in many individuals after being stung from 1 to 30 times. The blood serum appears to acquire specific antivenin, which neutralizes the effect of the sting. It is suggested that experiments along this line may perhaps demonstrate the possibility of artifical immunization by means of serum vaccination.

Foul brood and its prevention in Ireland (*Jour. Bd. Agr. [London], 9 (1902), No. 2, pp. 223, 224*).—Notes are given on the distribution and prevalence of this disease in Ireland. It is stated that for the purpose of facilitating the adoption of reliable methods for treating this disease hives are being provided with a hole which may be closed with a shutter; a cloth or sponge saturated with a 10 per cent solution of formalin may be inserted in the hole for fumigation purposes.

Bombyx faidherbei, Dumas (*Agr. Prat. Pays Chauds, 2 (1902), No. 8, pp. 235, 236*).—The larva of this silkworm lives on the lower surface of the leaves of *Zizyphus orthacantha*, and is of about the size of the larva of the common silkworm. The total duration of the larval period is about 42 days. It is stated that the moth closely resembles the common silkworm moth. The female lays 50 to 100 eggs and the period of incubation is from 7 to 8 days.

FOODS—NUTRITION.

Scope and results of the nutrition investigations of the Office of Experiment Stations, A. C. True (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1901, pp. 437–482*).—A brief historical account of the growth of nutrition investigations in the United States, together with detailed statements of those carried on under the auspices of the Office of Experiment Stations and suggestions regarding future work.

The form in which starch occurs in fresh and stale bread, L. Lindet (*Bul. Soc. Chim. Paris, 3. ser., 27 (1902), No. 12, pp. 634–639*).—Using the methods which he has elaborated, the author studied the starch and its derivatives in the crust and crumb of bread and in fresh and stale bread. The results of his analyses of the crust and crumb of bread follow, the coefficients of absorption representing the ratio of the space occupied by a gram of wet starch to that occupied by a gram of dry starch:

Comparison of the crust and crumb of bread.

	Water.	In dry matter.		For 100 parts of total starch—			Coefficient of absorption
		Reducing sugar.	Saccharose.	Dextrin.	Starch soluble.[a]	Starch insoluble.[a]	
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	
Crumb interior	44.8	1.2	0.6	6.7	10.7	82.6	4.4
Crumb surface	44.1	1.3	.7	9.6	10.6	79.8	4.6
Lower crust	19.3	1.4	.9	16.9	2.1	81.0	4.7
Upper crust	15.7	1.3	.9	11.8	1.5	81.7	4.1

[a] In dilute hydrochloric acid.

Similar determinations were made with the crust and crumb of freshly baked and stale bread, which show, according to the author, that as bread grows stale the water content of the crust increases, while the dextrin content, the proportion of starch insoluble in dilute hydrochloric acid, and the coefficient of absorption remain practically unchanged. On the other hand, in the case of the crumb, the water content, the percentage of dextrin, and the coefficient of absorption diminish, while the proportion of starch insoluble in dilute hydrochloric acid increases. The results are discussed in relation to the food value of bread.

The effect of decortication and grinding upon assimilation, and experiments on the effect of adding wheat flour to rye bread, K. B. Lehmann (*Arch. Hyg., 45 (1902), No. 2, pp. 177–211*).—The author studied especially the digestibility of Avedyk and Steinmetz rye breads as compared with ordinary rye bread, and also the digestibility of bread made from a mixture of rye and wheat. The conclusion is drawn that bread made from rye, ground according to the Steinmetz method and containing not less than 15 per cent of bran, was about equal in nutritive value to ordinary rye bread.

Rice for bread making, H. Neuville (*Jour. Agr. Trop., 2 (1902), No. 16, pp. 292–294*).—A discussion of the use of rice mixed with wheat flour for bread making, with citations from early and recent work on the subject.

Some uses and abuses of common foods, Emma J. Davenport (*Illinois Assoc.*

Dom. Sci. Rpt. 1902, pp. 70–78).—The author discusses especially the erroneous views often advanced regarding the food value of potatoes, white wheat flour bread, and pork.

Canned salmon, T. Macfarlane (*Lab. Inland Rev. Dept. Ottawa, Canada, 1901, Bul. 76, pp. 17*).—No added preservative was found in 100 samples of canned salmon examined. Ninety-five per cent of the samples were considered satisfactory as to quality.

Composition of poi, E. C. Shorey (*Pacific Commercial Advertiser, Honolulu, 1902, Sept. 18, p. 11*).—Partial analyses are reported of 8 samples of poi obtained in Honolulu.

Uses of marine algæ in Japan, K. Yendo (*Postelsia, the Yearbook of the Minnesota Seaside Station, 1901. St. Paul, 1902, pp. 3–18, pls. 6*).—A number of marine algæ are described which are used in Japan for food and for other domestic purposes.

The use of bamboo seed as food, M. Wallinger (*Indian Forester; abs. in Rev. Sci.* [*Paris*], *4. ser., 18* (*1902*), *No. 3, p. 94*).—Facts are given regarding the use of bamboo seed for food in India.

Cocoa and chocolate, A. McGill (*Lab. Inland Rev. Dept. Ottawa, Canada, 1900, Bul. 72, pp. 12*).—Analyses of a number of samples of cocoa and chocolate are reported.

Cloves, T. Macfarlane (*Lab. Inland Rev. Dept. Ottawa, Canada, 1900, Bul. 73, pp. 14*).—This bulletin contains a report of the examination of a number of samples of cloves, whole and ground.

Subject list of works on domestic economy, foods, and beverages (*Patent Office* [*London*] *Libr. Ser. No. 9, Bibl. Ser. No. 6, 1902, pp. 136*).—In addition to works on domestic economy, food, and beverages, this volume, as is stated in the subtitle, includes articles on the culture of cacao, coffee, barley, hops, sugar, tea, and the grape.

Technical education of bakers and confectioners, C. T. Millis (*Jour. Dept. Agr. and Tech. Instr. Ireland, 2* (*1902*), *No. 4, pp. 601–608, pl. 1, figs. 2*).—A description of the London, England, National School of Bakery and Confectionery, and the course of instruction provided.

Concerning tin from a hygienic standpoint, especially that found in preserved foods, K. B. Lehmann (*Arch. Hyg., 45* (*1902*), *No. 1, pp. 88–115*).—A review of the literature on the subject and experiments, which are reported, led to the conclusion that tin may cause acute digestive disturbances which are usually not serious. Other deductions have to do with special phases of the subject.

Concerning the occurrence and identification of fruit sugar in the fluids of the human body, C. Neuberg and H. Strauss (*Ztschr. Physiol. Chem., 36* (*1902*), *No. 2–3, pp. 227–238*).—The authors' investigations led to the conclusion that occasionally, though not always, levulose is found in the blood serum and other fluids of the human body and occurs whether levulose has been consumed or not.

The digestibility of fats and oils, with special reference to emulsions, J. W. Wells (*British Med. Jour., 1902, No. 2181, pp. 1222–1224*).—A very brief account of experiments on the digestibility of cod-liver oil, cod-liver-oil emulsion, and petroleum emulsion. The metabolism of nitrogen was also studied.

Concerning the effect of muscular work upon metabolism, I. Kaup (*Ztschr. Biol., 43* (*1902*), *No 2, pp. 221–255*).—Experiments were made, of which the author was the subject, on the effect of muscular work on the metabolism and excretion of nitrogen, sulphur, and phosphorus. The muscular work consisted in mountain climbing. The author's conclusion was that considerable muscular work can be performed without increasing the cleavage of protein provided the diet contains an abundance of nitrogen-free nutrients. In discussing his results the author takes account of the lag in the excretion of the constituents studied. The digestibility of the ration was not affected by the muscular work performed.

Albumin in relation to hygiene and the feeding problem, Finkler and H. Lichtenfelt (*Centbl. Allg. Gesundheitspfl., 21 (1902), Sup., pp. VI+186*).—The authors discuss especially the nutritive value of meat extracts, plasmon, and other similar nitrogenous food products. In many cases the analyses of such goods are reported as well as digestion and metabolism experiments.

Experiments on the amount of food required daily by man with especial reference to protein, R. O. Neumann (*Arch. Hyg., 45 (1902), No. 1, pp. 1–87, dgms. 3*).—The author discusses dietary standards and summarizes results, quoting extensively from the literature of the subject. He also reports dietary studies and metabolism experiments, of which he was himself the subject, covering a total of 746 experimental days. On an average the daily diet furnished 74.2 gm. protein, 117 gm. fat, and 213 gm. carbohydrates, the energy value being 2,367 calories. This was sufficient for maintaining the body weight, which was on an average 70 kg. The conclusion is drawn that it is possible to maintain nitrogen equilibrium on a much smaller quantity of protein than Voit's standard calls for without, at the same time, increasing the amount of carbohydrates. On the contrary, he believes the amount of carbohydrates (500 gm.) may be diminished. The author discusses his results at length and among other points considers the energy value of alcohol. The article contains a bibliography.

ANIMAL PRODUCTION.

Analyses of commercial feeding stuffs, J. L. Hills, C. H. Jones, and B. O. White (*Vermont Sta. Bul. 97, pp. 11–24*).—In accordance with the State feeding stuff law, analyses were made of 218 samples of cotton-seed meal, cotton-seed feed, old and new process linseed meal, gluten meals and feeds, commercial feeds and cereal breakfast food by-products, calf meal, and animal meal. None of the cotton-seed meals, feeds, or wheat products was found to be adulterated.

"The better grades of oat feeds, corn and oat feeds, etc., were found, as usual, to meet the claims made for them by the manufacturers. The poorer grades—likewise as usual—were of lower grade than even their small promises indicated.

"Ninety per cent or thereabouts of the provenders (other than the output of the oatmeal mills) seem to be above reproach. Ten per cent were more or less open to question, while a few were almost surely laden with extraneous hulls."

Fodders and feeds, L. A. Voorhees and J. P. Street (*New Jersey Stas. Rpt. 1901, pp. 78–136*).—*Concentrated feeding stuffs* (pp. 78–128).—Abstracted from another publication (E. S. R., 12, p. 675).

Average analyses of fodders and feeds (pp. 129–134).—A compilation of analyses made at the station of fodders and feeding stuffs.

Market prices of commercial feeds (pp. 135,136).—The authors give in tabular form figures showing the average cost of a number of commercial feeds in New Jersey since 1895, the records on which the figures are based in each case covering the 6 months preceding January 1.

By-products of the starch industry in the United States (*Jour. Soc. Arts, 50 (1902), No. 2592, pp. 737, 738*).—A brief descriptive and statistical article on starch by-products used as feeding stuffs.

Zein as a nutrient, I. W. Szumowski (*Ztschr. Physiol. Chem., 36 (1902), No. 2–3, pp. 198–218, pl. 1*).—The chemical characteristics and feeding value of zein, the principal proteid of maize, were studied. According to the author, dilute caustic alkali (1 per cent solution) induces a modification of zein which is soluble in water. When maize was fed to geese and doves zein did not accumulate in the organs of the body. Zein injected into the circulation acted as a poison and was stored up in the liver.

Experiments on the composition and digestibility of dried potatoes, O. Kellner, J. Volhard, and F. Honcamp (*Deut. Landw. Presse, 29 (1902), No. 85,* *p. 691*).—A sample of dried potatoes was prepared and analyzed. The dried and ground material, when mixed with water, is said to resemble cooked potatoes. The digestibility of this material was studied with sheep, the following coefficients of digestibility being obtained: Dry matter 80.1, organic matter 81.5, protein 19.5, and nitrogen-free extract 92.0 per cent. The advisability of drying potatoes for fodder in times of overproduction is discussed.

Sugar-cane fodder, L. Acutt (*Agr. Jour. and Min. Rec.* [*Natal*], *5* (*1902*), *No. 10, pp. 319–321*).—According to the author, who discusses sugar cane growing for forage, this material is a useful feeding stuff, especially for winter. If the cane has been touched by frost, he believes that it should be harvested and the harder portions cut with a chaff cutter, as this will not keep for any length of time, while the balance of the crop should be stacked. It is stated that cattle are very fond of old cane tops.

Concerning sunflower-seed cake, R. Windisch (*Landw. Vers. Stat.*, *57* (*1902*), *No. 3–4, pp. 305–316*).—The author reports analyses of sunflower seed, cake and hulls, and discusses these figures and those obtained by other investigators.

Fodder value of barley grass, F. B. Guthrie and A. A. Ramsay (*Agr. Gaz. New South Wales*, *13* (*1902*), *No. 3, pp. 309–311*).—An analysis of this grass is reported.

The progress of protein cleavage when the diet supplies an abundance of protein, O. Frank and R. Trommsdorff (*Ztschr. Biol.*, *43* (*1902*), *No. 2, pp. 258–287*).—In experiments with a dog the authors studied the excretion of nitrogen and carbon dioxid when the diet supplied an abundance of protein, especial attention being paid to the variations observed when the diurnal excretion was considered by short periods.

Concerning the cleavage of carbohydrates by animal ferments, plant ferments, and enzyms, W. N. Clemm (*Arch. Physiol.* [*Pflüger*], *89* (*1902*), *No. 9–10 pp. 517–526*).—Digestion experiments with saliva ptyalin, pancreas extract, pancreatin, pig and dog liver ferments, and diastose extract, led to the conclusion that pancreas ptyalin formed more than one sugar from starch, and that the sugars formed were different from those produced by the action of saliva ptyalin.

The behavior of glycogen in boiling potassium hydroxid solution, E. Pflüger (*Arch. Physiol.* [*Pflüger*], *92* (*1902*), *No. 3–5, pp. 81–101*).—According to the author's investigation glycogen can be heated for a number of hours at 100° in strong potassium hydroxid solution without undergoing decomposition. On the other hand glycogen prepared by the Brücke-Külz method was partially decomposed when heated in dilute potassium hydroxid solution.

Concerning the glycogen content of the cartilage of vertebrates, E. Pflüger (*Arch. Physiol.* [*Pflüger*], *92* (*1902*), *No. 3–5, pp. 102, 103*).—The author reports the quantitative estimation of glycogen in fresh horse cartilage.

Contribution to the subject of the glycogen content of the skeleton, M. Händel (*Arch. Physiol.* [*Pflüger*], *92* (*1902*), *No. 3–5, pp. 104–114*).—Experiments with the bones, sinews, and cartilage of a dog and with the marrow and other parts of the bones and also with the sinews and cartilage of a steer, are reported. In the case of the steer the amount of glycogen varied from 0.0059 per cent in sinew to 0.2168 per cent in cartilage. The dog bones were found to contain 0.008 per cent, the sinew 0.030 per cent, and the cartilage 0.160 per cent glycogen. According to the author all portions of the skeleton contain glycogen which can be extracted with potassium hydroxid solution. The glycogen may be precipitated with alcohol and the precipitate is not flocculent. The amount of glycogen in bones and sinews is very small; the amount in cartilage is considerably larger.

Concerning the saponification which is brought about by gall and the estimation of soaps in the presence of fatty acids in gall mixtures, E. Pflüger (*Arch. Physiol.* [*Pflüger*], *90* (*1902*), *No. 1–2, pp. 1–32*).—A contribution to the study of the assimilation of fat (E. S. R., 13, p. 775). Experimental methods are described and results obtained are reported.

The physiological action of formaldehyde, W. Koch (*Amer. Jour. Physiol., 6 (1902), No. 5, pp. 325–329*).—From experiments which are reported, the conclusion was drawn that trypsin "like a starch or fat splitting enzym, is not directly affected by formaldehyde. . . . Fibrin, on the other hand, is rendered more or less indigestible, depending on the strength of the formaldehyde and the time of exposure. We may conclude from this that formaldehyde does not act by forming active oxygen, nor by destroying the zymase, but brings about the death of the cell indirectly by rendering its proteid food supply useless and by preventing the digestion of proteids always going on within the protoplasm of the cell, a reaction intimately connected with the life of the organism."

Concerning the modifications which warm and moist surroundings produce in the respiratory quotient, V. Grandis and C. Mainini (*Arch. Ital. Biol., 37 (1902), No. 2, pp. 281–297, fig. 1*).—The results of experiments with small animals and pigeons are reported.

Market classes and grades of cattle, with suggestions for interpreting market quotations, H. W. Mumford (*Illinois Sta. Bul. 78, pp. 367–433, figs. 48*).—On the basis of an extended study of the subject in the Chicago Union Stock Yards the author discusses the principal classes of cattle and grades in which the classes are subdivided commercially, the purpose of the bulletin being to familiarize feeders and breeders of beef cattle with the market conditions. The importance of such a classification is shown by the fact that hitherto there has been no uniformity in the use of terms by those who raise and sell cattle or report market transactions in them. Recognizing the fact that in the nature of the case any classification must be more or less arbitrary, the following is submitted, which in the author's opinion represents the distinction actually made:

Market classes and grades of cattle.

CLASSES.

- Beef cattle:
  - Prime steers.
  - Choice steers.
  - Good steers.
  - Medium steers.
  - Common rough steers.
- Butcher stock:
  - Prime heifers.
  - Choice heifers.
  - Good heifers.
  - Medium heifers.
  - Prime cows.
  - Choice cows.
  - Good cows.
  - Medium cows.
  - Common rough steers.
  - Choice bulls.
  - Good bulls.
  - Medium bulls.
- Cutters and canners:
  - Good cutters.
  - Medium cutters.
  - Common cutters and good canners.
  - Medium canners.
  - Inferior canners.
  - Bologna bulls.
- Stockers and feeders:
  - Fancy selected feeders.
  - Choice feeders.
  - Good feeders.
  - Medium feeders.
  - Common feeders.
  - Inferior feeders.
  - Feeder bulls.
  - Fancy selected yearling stockers.
  - Choice yearling stockers.
  - Good yearling stockers.
  - Medium yearling stockers.
  - Common yearling stockers.
  - Inferior yearling stockers.
  - Good stock heifers.
  - Medium stock heifers.
  - Common stock heifers.
- Veal calves:
  - Choice.
  - Good.
  - Medium.
  - Common.

SUBCLASSES.

Texas and Western range cattle.

Distillers.

MISCELLANEOUS.

Baby beef.

Export cattle.

Shipping steers.

Dress beef cattle.

Stags.

The different classes and grades are discussed and described. Some of the author's deductions follow:

"The names of the various classes indicate the uses to which cattle in those classes are put. The grades refer to quality, condition, and conformation, the relative importance of which factors, so far as they influence market values, is indicated by the order in which they have been enumerated, quality being of greatest importance, condition next, and conformation of least importance. Weight has relatively but small influence in determining the grade and price of fat cattle. Quality and condition largely govern both.

"[The producers should] become thoroughly familiar with the characteristics of prime steers and choice feeders; these are the standard grades of fat cattle and feeders. Fluctuations in the market affect these grades less than others. It is, therefore, more difficult to determine an approximately correct valuation for a lot of low-grade cattle than for cattle of higher grades.

"The terms export, shipping, and dressed beef steers are no longer significant of any particular grade of cattle. Several different grades and even different classes are exported, shipped, and used for dressed beef. The most desirable steer for export, for shipping, and for the best grades of dressed beef either for domestic or foreign trade is the same in each instance. The best grade of any class of cattle must be practically above criticism.

"When cattle grade the best of their class they command a premium on the market. Such cattle usually sell at strong prices and for their full value. Cattle of the lower grades, necessarily deficient in certain particulars, sell at a discount, which in many instances is greater than their inferiority demands. Thus it will be seen that the tendency is to spring the market for choice, prime, and fancy grades while the common and medium grades are seldom, if ever, sold for more than they are worth, and many times they do not bring their full value owing to a tendency on the part of buyers to magnify defects of minor importance."

Feeding native steers, A. M. Soule and J. R. Fain (*Tennessee Sta. Bul. Vol. XV, No. 3, pp. 111-140, figs. 14*).—Continuing previous work on the possibility of profitably feeding native Tennessee steers (E. S. R., 13, p. 76), 3 tests were made to compare dry and succulent rations, cowpea hay and cotton-seed meal, and to learn the relative merits of cotton-seed meal and cotton-seed bran. The lots used in the 3 tests were numbered consecutively. In the first test, which was made in 1900, 2 lots of 4 steers each were fed corn meal and corn stover, lot 1 receiving cowpea hay in addition and lot 2 a mixture of cotton-seed meal and cotton-seed bran.

Three lots of 4 and 1 of 3 steers were used in the second test, which was carried on in 1901. All the lots were fed corn meal. In addition, lots 3 and 5 were fed cowpea hay and lots 4 and 6 cotton-seed meal. Lots 3 and 4 were also fed corn stover and lots 5 and 6 silage; for 60 days this consisted of corn and during the remainder of the test of sorghum.

The test in 1902 was also made with 3 lots of 4 and 1 of 3 steers. The grain ration of lots 7 and 8 consisted of corn meal and cotton-seed meal, 1:2; that of lots 9 and 10 of cotton-seed meal and cotton-seed bran, 52:48. In addition to corn, lots 7 and 9 were fed cowpea hay and silage, and lots 8 and 10 cowpea hay and corn stover. After 30 days the feeding of cotton-seed meal to lots 9 and 10 was discontinued and the amount of cotton-seed bran was increased. The first test covered 91 days and the other 2 tests 120 days each, tests 1 and 2 being preceded by a preliminary period of 7 days and test 3 by a preliminary period of 14 days. At the beginning of the test the average weight of the steers in lots 6 and 10 was 2,648 lbs. and 2,386 lbs., respectively. The steers in the other lots weighed on an average from about 3,200 to 3,500 lbs. each. At the close of the test the steers were slaughtered and the quality of the beef judged. The following table shows the principal results of the tests:

Results of feeding native steers.

	Average daily gain per steer.	Feed eaten per pound of gain.						Net cost of a pound of gain.		Good cuts in carcass.
		Corn silage.	Corn stover.	Cowpea hay.	Cotton-seed bran.	Cotton-seed meal.	Corn meal.	Rating feeds at high prices.	Rating feeds at low prices.	
Test 1:	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Cts.*	*Cts.*	*Per ct.*
Lot 1	1.8	......	2.2	4.8	......	......	3.7	5.2	3.6	53.0
Lot 2	1.6	......	2.2	......	6.0	2.5	1.4	6.9	6.2	52.2
Test 2:										
Lot 3	1.3	......	4.3	6.0	......	......	4.8	6.6	4.3	55.3
Lot 4	1.1	......	6.6	......	......	2.3	5.6	6.9	5.0	57.1
Lot 5	1.5	21.4	......	2.3	......	......	4.2	6.1	4.2	56.2
Lot 6	2.1	18.7	......	......	......	1.3	3.2	4.7	3.5	57.5
Test 3:										
Lot 7	1.9	14.6	......	2.3	......	2.0	2.1	6.0	5.0	56.5
Lot 8	1.5	......	3.8	4.0	......	2.5	2.7	7.0	5.4	55.2
Lot 9	1.4	20.3	......	3.6	2.1	3.2	......	6.5	5.6	54.6
Lot 10	1.2	......	4.3	5.5	2.5	3.7	......	6.3	5.2	53.9

The average amount of water consumed per head daily ranged from 23.8 lbs. with lot 6 to 54.9 lbs. with lot 10. The authors discuss the amount which the steers lost in driving them 2 miles to the stock yards and slaughtering, and record the weight of the liver and intestinal fat. Estimates are also made of the cost of feeding and care, taking into account the value of the manure produced and also the profits obtained. Rating feeding stuffs at high prices the least profit, $2.09, per head was obtained with lot 2, and the greatest profit, $7.83, with lot 10. Rating feeding stuffs at low prices the least profit, $3.06, was obtained with lot 2, and the greatest profit, $9.38, with lot 7.

"Leaving out of consideration the preliminary feeding, very satisfactory gains can be made with native cattle, varying from 1.2 to 2.1 lbs. per head per day, depending largely on the character of the ration fed. With 6 of the groups a gain of practically 1.5 lbs. per day was made throughout the entire feeding period."

The results obtained with silage, cotton-seed meal, and corn meal, according to the authors, show that this ration was the most satisfactory as regards palatability and gains made, and it is regarded as the best ration for the average Southern farm. The tests indicate that cowpea hay can frequently be substituted to advantage for cotton-seed meal. Some 6 to 10 lbs. of cowpea hay was satisfactorily substituted in the above test for some 3 to 5 lbs. of cotton-seed meal.

"As large crops of pea hay can be cheaply produced in the South, it can frequently be utilized to advantage in place of corn and cotton-seed meal, especially when these concentrates are high priced. Pea hay can not be so successfully substituted for cotton-seed meal where a succulent ration is fed as a dry ration."

Succulent rations gave better results than dry rations, the total gain on the former being 761 lbs. more than on the latter. The former was also found to be more profitable.

"The average results of two years' trials on the University farm show that about 7.8 tons of corn silage and 7.2 tons of sorghum silage can be obtained per acre. The cost of corn silage is $17.08 and the sorghum silage $12.81 per acre. Silage from either source is equally satisfactory as a roughness for beef cattle, though owning to the fact that sorghum silage can be grown as a 'second crop' it can be produced for some less than the corn silage. Stover is not as satisfactory a roughness as silage."

According to the authors cotton-seed bran did not prove satisfactory when fed alone as a coarse fodder or when substituted for 48 per cent of the cotton-seed meal in a ration.

"The farmer can produce his own roughness for less than he can buy it, and it will always be to his interest to buy the pure cotton-seed meal. . . . The average slaughter test of the dry-fed cattle was 55.4 per cent, and of the succulent-fed cattle 56.4 per cent. The weight of good meat in the carcass of the dry-fed cattle was 8,106 lbs., and in the succulent-fed cattle 8,683 lbs., a difference of 577 pounds of salable meat in favor of the succulent-fed cattle. The necessity of improving our native stock is shown by the slaughter test, which was about 55 per cent for all the groups. The average cattle slaughtered in Southern abattoirs do not dress over 50 per cent, whereas they should dress 60 per cent with animals of the weight and size of those considered in the experiments of 1902. This would amount to a loss of 96.2 lbs. per head, which at a selling price of 8 cts. per pound means a loss of $7.70 per animal."

In the authors' opinion a number of the lots could have been profitably fed for a longer period.

Feeding experiments, E. R. LLOYD (*Mississippi Sta. Rpt. 1902, pp. 16–18*).—Brief notes are given regarding the feeding of cows, beef cattle, mules, and sheep at the station. Using 2 lots of mules, the feeding value of cotton-seed meal as part of the ration was tested, 1 lot being fed wheat bran and cotton-seed meal 3:1 and the other bran and cotton-seed meal 1:1. The mixtures were eaten sparingly at first and at the end of 6 weeks were practically refused. It was thought this might have been due to the fact that the mules had not been accustomed to wheat bran, and corn chops was, therefore, substituted for it; but, according to the author, they still refused to eat enough of the mixture to keep them in good working condition, and at the end of 90 days they were losing flesh so rapidly that the cotton-seed meal was discontinued.

Statistics are given regarding the station flock of sheep. The average cost of wintering was 99 cts. per animal, the ration fed consisting of cotton-seed meal, cotton-seed hulls, and shredded corn fodder. The feeding experiments with cows are more extensively noted elsewhere (p. 606). The test with beef cattle has been reported in a previous publication (E. S. R., 14, p. 483).

Cattle rearing in Egypt, J. L. SMITH (*Jour. Khedir. Agr. Soc. and School. Agr., 4 (1902), No. 4, pp. 161–165*).—The author discusses the conditions and requirements for successful cattle raising under local conditions.

Swine feeding in Colorado, B. C. BUFFUM and C. J. GRIFFITH (*Colorado Sta. Bul. 74, pp. 29, figs. 2*).—With a view to learning the possibilities of pig raising in Colorado, where large corn crops are not grown, 4 tests were made of the feeding value of sugar beets, sugar-beet pulp, and alfalfa, and of barley and other local grown grains as compared with corn. As pointed out by the authors, the sugar-beet crop and the alfalfa crop in Colorado are very large, and great quantities of sugar-beet pulp are available for feeding should it prove satisfactory. An analysis of the pulp is quoted.

The first of the tests reported was made with 5 lots each containing 4 grade pigs, averaging not far from 100 lbs. in weight at the beginning of the trial. Lot 1 was fed chopped sugar beets only, lots 2, 4, and 5 ground wheat and barley, 1:1, and lot 3 shelled corn. In addition, lot 2 was fed beet pulp and lot 5 sugar beets. The test covered about 100 days. The average daily gain per pig in the 5 lots was 0.17, 0.89, 0.70, 1.16, and 0.94 lbs., respectively, the cost of a pound of gain being 12.3, 4.3, 7, 4.5, and 5 cts. Lots 1, 3, and 4 required respectively 10.37 lbs. of sugar beets, 3.8 lbs. of corn, and 5.25 lbs. of the wheat and barley mixture per pound of gain. Lot

2 required 7.1 lbs. of sugar-beet pulp and 3.46 lbs. wheat and barley mixture, while lot 5 required 3.76 lbs. of sugar beets and 4 lbs. of the same grain. In lot 1 the dressed weight was 77 per cent of the live weight. In the case of lots 2 and 3, it was 80 per cent and in case of lots 4 and 5 it was 84 per cent. Rating pork at 6 cts. per pound there was a loss of $1.04 and 71 cts. in lots 1 and 3, and a profit of $1.50, $1.75, and 96 cts., respectively, in lots 2, 4, and 5. Rating pork at 7 cts. per pound, there was a profit of 13 cts., $3.35, 95 cts., $3.90, and $2.93, in the 4 lots respectively.

The second test was made with 9 Berkshire pigs divided into 3 lots of 3 each, averaging about 150 lbs. in weight at the beginning of the trial. Lot 1 was fed alfalfa hay, corn, and barley, consuming 0.49, 3.72, and 1.72 lbs. per pound of gain, respectively. Lot 2 was fed corn and barley, the amounts required per pound of gain being 3.63 and 1.65 lbs. Lot 3 was fed corn, barley, and sugar beets, requiring 3.64, 1.91, and 1.03 lbs. per pound of gain. In the 95 days of the test the average daily gain per pig in the 3 lots was 1.13, 1.08, and 0.99 lbs., and the cost of a pound of gain 4.9, 4.6, and 5.2 cts. The calculated profit, rating pork at 5 cts. per pound, was $1.73, $1.94, and $1.26. The dressed weight of the pigs in lot 1 averaged 86.1 per cent of the live weight. The values for the other 2 lots were very similar, being 87.4 per cent for lot 2 and 87.1 per cent for lot 3.

The third test reported was made with 4 lots of Berkshire pigs, lot 2 containing 2 animals and the other lots 3, the average weight at the beginning of the trial for the 4 lots being 164.5, 104, 112.5, and 98 lbs., respectively. In the 69 days covered by the test the pigs in lot 1 made an average daily gain of 0.98 lb. on a ration of corn only, consuming 6.43 lbs. per pound of gain. In the case of lot 2 the gain was 1.11, the food eaten per pound of gain being 3.08 lbs. corn and 3.01 lbs. shorts. In the case of lot 3, the average daily gain was 1.31 lbs., the food required per pound of gain being 2.61 lbs. of shorts, 0.88 lb. wheat, 0.85 lb. oats, and 0.87 lb. barley, the grains being so rotated that shorts were fed with wheat and oats on 1 day, with wheat and barley the next, and with oats and barley the next. With lot 4 the average daily gain was 1.27 lbs. and the food eaten per pound of gain, 2.43 lbs. corn, 0.84 lb. wheat, 0.80 lb. oats, and 0.80 lb. barley, the corn being rotated with the other grains, as in lot 3. The average cost of a pound of gain in the 4 lots was 5.3, 4.8, 4.7, and 4.7 cts., respectively, and the total profit per lot, rating pork at 5 cts. a pound, $1.41, $1.18, $0.69, and $1.19. The dressed weight in the 4 lots was 78.6, 77.4, 81.6, and 79.2 per cent of the live weight, respectively.

The principal deductions drawn from these tests as a whole follow:

"Home-grown grains fed in proper proportion to balance the ration are more valuable than corn.

"A well balanced ration gives better returns in every case than a poorly balanced ration, and a mixture of grains is better than a single grain fed alone.

"Sugar beets for swine feeding were unprofitable with us, either fed alone or in combination with grain. Green pasture would probably serve the purpose of furnishing succulent food for growing pigs at less expense.

"Sugar beets are little more than a maintenance ration when fed alone to hogs.

"Sugar beets and sugar-beet pulp proved equally valuable in our experiments, and because of its cheapness and effect on growth we believe pulp may be profitable to feed to growing pigs in connection with a grain ration, or during the first part of a fattening period.

"These experiments indicate that sugar beets may have a value of about $1.50 per ton when fed to hogs in combination with grain. Beet pulp gave a return of $1.50 per ton when fed in combination with grain.

"Sugar-beet pulp served the same purpose in our hog rations as did sugar beets and at less expense. It was necessary to mix beet pulp with grain in order to educate the pigs to eat it. We would not recommend feeding more than 2 lbs. of pulp to 1 lb. of grain in a ration for pigs which are from 100 to 200 lbs. in weight.

Our trials indicate that pigs take some of the nutritive property from beets, but their principal use, as well as that of pulp, seems to be mechanical.

"Dry alfalfa hay as roughage may be made use of by the growing pigs. In our trials the pigs ate more grain and made more gain than on a similar grain ration minus the alfalfa.

"Comparing our results with pig feeding experiments in other States, indicates that our small grains, more especially our barley and wheat, are worth more compared with corn than similar grains raised under rainfall conditions.

"Mixed wheat and barley ground together make a well balanced ration for pigs and one upon which they will make better growth and gain than they will on a ration composed of corn alone. The farmer in Colorado can not ordinarily afford to sell his home grown grain and purchase corn for fattening hogs. Wheat and barley in equal parts were worth 17 per cent more than corn fed alone."

The influence of condimental stock food in fattening swine, C. S. Plumb (*Indiana Sta. Bul. 93, pp. 117–123*).—The first of the 2 tests reported was made by H. E. Van Norman, with 8 pigs divided into 2 lots of 4 each. Lot 1 was fed shorts and hominy feed 1:1 with 2.1 oz of American Stock Food per head daily in addition. Lot 2 was fed the same grain ration but no stock food. The average weight of the pigs in the beginning of the test, which covered 122 days, was 65 and 64 lbs. respectively. The average daily gain per pig was 1.42 and 1.43 lbs.; the food eaten per pound of gain, 3.84 and 3.71 lbs., and the cost of food per pound of gain, 3 cts. and 2.6 cts., respectively. According to the author, the best results were obtained without condimental feed.

Two lots of 3 grade pigs each, weighing on an average 63 lbs. each, were used in the second test which was carried on by C. W. Ely. Each lot was fed corn meal and shorts 1:1. In addition the pigs in lot 1 were fed 0.4 oz. per head daily of Rauh's Stock Food during the first 5 weeks of the test and during the last 7 weeks of Standard Stock Food. The average daily gain of the 2 lots was 1.6 and 1.5 lbs., respectively; the feed eaten per pound of gain, 3.51 and 3.62 lbs., and the profits on the 2 lots $6.98 and $6.50 respectively. In this test a somewhat greater profit was obtained with the lot given condimental food.

"In themselves, there is no special objections to stock foods. In fact there are brands made that are rich in nutriment, and have a high value as a food. The principal criticism that can be made is the excessive price generally charged for them, which is far beyond their value. No doubt, in many cases oil meal will give fully as satisfactory results as the stock food. The feeder should study this matter carefully, and if he will use a variety of food, including oil meal, and will ascertain the value of some of the more common tonics that may be given stock in the foods, he will secure no doubt equally good results at the least cost. He will in fact be able to make his own stock food, and thus save paying high prices for feed of an unknown character."

Giant lily as a food for pigs (*Agr. Gaz. New South Wales, 13 (1902), No. 2, pp. 255, 256*).—It was found that pigs would readily eat giant lily bulbs (*Dyanthes excelsa*), if they were cooked and a little ground maize added. An analysis of the bulbs is reported.

Organized poultry work in England, G. M. Curtis (*Reliable Poultry Jour., 9 (1902), No. 8, pp. 706–709, figs. 9*).—A description of the poultry farm at Reading College, England, and the instruction which is given in poultry raising.

Scientific studies of oyster propagation, J. Nelson (*New Jersey Stas. Rpt. 1901, pp. 307–351, pl. 1, figs. 8*).—A description is given of the author's experiments on the artificial propagation of oysters with special reference to the fertilization of the egg. The time after fertilization at which the developmental changes occur in oyster eggs at different air temperatures is noted. The figures obtained show that the changes became greater as the temperature increased. Some irregularities are discussed.

"We know from this and from previous reports that the eggs of any one oyster do not all develop at the same rate, and that the vigor of all the eggs in an oyster rapidly declines after the oyster is removed from its native element. We also have abundant evidence that oysters differ greatly in the character and fertility of their eggs, even when first taken from the water.

"Again, we have, in this and previous reports, shown that the rate of development is dependent upon the supply of oxygen and the extent to which the eggs are stirred and crowded.

"Again, the various events are not sharp ones, but each occupies some time, beginning and ending with imperceptible changes and progressing to a climax gradually. It is difficult to observe the changes of similar phases in different lots of eggs.

"Finally, the temperature of the water is not equally a fixed number of degrees below that of the air. Also, the temperatures given [as part of the experimental data] are those obtaining at the beginning of each experiment, and therefore not accurately the average temperature in each experiment.

"These facts must all be considered in a set of experiments, in which conclusions are made, based on the variations in the rate of development. But, undoubtedly, the rate of development is an important index to the vigor and character of the spawn, and may, perhaps, come to figure prominently in a practical system of oyster propagation. Therefore, studies along this line can not be ignored during this, the experimental period of scientific oyster propagation."

DAIRY FARMING—DAIRYING.

Dairy husbandry, H. J. WATERS and C. H. ECKLES (*Missouri Sta. Bul. 56, pp. 31, figs. 6*).—This bulletin is issued with a view to awakening an interest in dairying in Missouri and disseminating reliable information on the subject. The introductory part, by H. J. Waters, contains a brief description of the new dairy building and the text of the State law establishing a chair of dairy husbandry in the College of Agriculture. The main part of the bulletin, by C. H. Eckles, deals with the dairy and crop production in Missouri, the adaptability of the State to dairying, the income from average and selected herds, the comparative profits in selling milk to creameries and cheese factories, dairying as a means of keeping up the fertility of the farm, the labor problem involved in dairying, the use of the hand separator on the farm, private and cooperative dairying, and other topics.

Missouri is considered well adapted to dairying on account of its mild climate, long pasturing season, productive soil, and good markets for dairy products. Estimates place the annual income of the average creamery patron in Missouri at $29.32 per cow. The income received from the creamery in 8 selected cases ranged from $37.14 to $61.23. Special attention is called to the fertilizing value of some of the farm products that are commonly sold from the farm and which may be utilized in dairying. The author believes that within a few years the hand separator will be considered as necessary a farm machine as the mower or harvester.

Report of the assistant in dairy husbandry, C. B. LANE (*New Jersey Stas. Rpt. 1901, pp. 269–303, pls. 16*).—An outline is given of the dairy work during 1901, which was along the lines followed in previous years and reported upon in the annual reports of the stations.

Soiling crops (pp. 272–278).—Notes are given on the 15 forage crops grown for soiling purposes during the year. A brief description is given of a cutaway, having 5 turning disks 24 in. in diameter and 5 smaller disks. The machine is drawn by 4 horses and is considered particularly valuable in preparing ground which has become too hard to plow. A good crop of hay was secured from seeding to grass without grain the previous fall.

Experiments with feeding oat and pea feed and straw v. oat and pea hay (pp. 278–284).—Oat and pea straw and oat and pea feed combined was compared with oat and pea hay in rations containing silage and cotton-seed meal in addition. The protein and fat were practically the same in both rations. The hay ration contained more dry matter and carbohydrates. The test was made with 2 lots of 2 cows each and lasted 30 days. The straw and feed ration produced 2.6 per cent more milk and 5.96 per cent more fat than the hay ration. The cost of milk production on the 2 rations was respectively 61.6 cts. and 49.9 cts. per 100 lbs., and the cost of butter production 11.9 and 10 cts. per pound. The hay ration, though producing less milk, was more profitable. A greater gain in live weight was also made on this ration.

Farm roads (pp. 284, 285).—Roads were constructed of (1) cinders, (2) cinders and gas lime, and (3) cinders and stone lime. The road constructed of cinders alone was always dry and stood traffic well for a short time but needed frequent repairs. The road constructed of gas lime and cinders in the proportion of 1 to 5 has been in use for 3 years and required no repairs. The odor of the lime is considered the only objection to this form of farm road. The use of slaked lime in place of gas lime, while more expensive, has given equally good results, without the presence of the disagreeable odor.

Description of the new wing of the dairy barn (pp. 286, 287).—The building is a one story frame structure 32 by 38 ft. providing stalls for dairy cattle.

Cost of producing milk (pp. 287–290).—Data for the cost of producing milk during the year are given and compared with similar data for previous years. The average cost of milk production for 5 years, including food, labor, and interest and decrease in the value of the herd, was 2.38 cts. per quart.

Soiling crop rotation (pp. 291–293).—Tabulated data are given for the various combinations of crops supplying forage to the dairy herd from May 1 to November 1.

Dairying in relation to soil exhaustion (pp. 293–295).—The amounts of fertilizing elements contained in the feeds purchased and in the milk produced by the dairy herd for 5 years are shown in tabular form. The total gain in fertilizing elements to the farm is estimated as equivalent to the nitrogen in 18.5 tons nitrate of soda, the phosphoric acid in 20.4 tons acid phosphate, and the potash in 1.78 tons of high grade muriate of potash. If no feeds had been purchased the exhaustion of nitrogen would have been in greater proportion than the mineral elements.

Record of dairy herd (pp. 295–303).—A monthly record of 26 cows is given for the year ended April 1, 1901. The average yield of milk per cow was 6,545 lbs. and the average fat content of the milk 4.29 per cent. The waste in handling and delivering milk during the year was 5.5 per cent.

Alfalfa, cowpeas, and crimson clover as substitutes for purchase feeds. Home-grown protein *v.* purchased protein, C. B. LANE (*New Jersey Stas. Bul. 161, pp. 23, pls. 4*).—In 3 feeding experiments which are reported in detail comparisons were made of home-grown rations and rations containing purchased feeds.

Alfalfa hay v. purchased feeds (pp. 4–11).—The alfalfa hay ration consisted of 13 lbs. of alfalfa hay and 30 lbs. corn silage, and the feed ration of 5 lbs. mixed hay, 30 lbs. corn silage, 6 lbs. wheat bran, and 5 lbs. dried brewers' grains. The 2 rations contained practically the same amount of protein. The nutritive ratios were 1:5 and 1:6.1 respectively. The test was made with 2 lots of 2 cows each and lasted 32 days. The feed ration produced 4.15 per cent more milk and 4.16 per cent more butter than the alfalfa ration. The fat content of the milk was the same for both rations. The cost of producing 100 lbs. of milk on the alfalfa ration was 55.9 cts., and on the feed ration 83.9 cts., and the cost of producing 1 lb. of butter on the 2 rations was respectively 11.1 and 16.7 cts. While more milk was produced on the feed ration, the alfalfa ration was more profitable. A greater gain in live weight was made on the alfalfa ration. Alfalfa is therefore considered a valuable crop for dairy purposes.

Crimson clover hay v. purchased feeds (pp. 11–16).—The crimson clover ration contained 60.4 lbs. crimson clover hay and 30 lbs. corn silage. The feed ration was the same as in the preceding experiment. The 2 rations contained the same amount of protein and had nutritive ratios of 1:5.7 and 1:6.1. The test, made with 2 lots of 2 cows each during a period of 30 days, showed that 18.1 per cent more milk was produced on the feed ration. The cost of producing 100 lbs. of milk on the crimson clover ration was 71.2 cts. and 1 lb. of butter 14.46 cts., the corresponding figures for the feed ration being 89.5 and 18.19 cts., respectively. The saving in the cost of food when the crimson clover ration was fed was more than equal to the increased yield when the feed ration was used. The increase in the live weight of the animals was greater on the crimson clover ration. This crop has been grown successfully at the station for a number of years.

Cowpea silage and crimson clover hay v. purchased feeds (pp. 16–23).—The home-grown ration contained 36 lbs. cowpea silage, 10 lbs. crimson clover hay, and 6 lbs. corn-and-cob meal, and the feed ration, 36 lbs. corn silage, 5 lbs. mixed hay, 4 lbs. dried brewers' grains and 2.5 lbs. cotton-seed meal. As in the previous experiments the test was made with 2 lots of 2 cows each and lasted 30 days. The 2 rations were practically identical as regards nutrients. The yield of milk and butter on the 2 rations was practically the same. The cost of producing 100 lbs. of milk was 66.9 cts. on the home-grown ration, and 69.9 cts. on the purchased feed; and the cost of producing 1 lb. of butter was 15.1 and 14.9 cts. respectively. The home-grown ration was considered therefore equally as good as the purchased ration. The composition of fodders and feeds used in the experiments is shown in a table.

The relative value of protein in cotton-seed meal, cowpea hay, and wheat bran, A. M. Soule and S. E. Barnes (*Tennessee Sta. Bul. Vol. XV, No. 4, pp. 143–163, figs. 8*).—Dairying in the South is discussed to some extent in this bulletin, and a cooperative experiment between the station and the Bureau of Animal Industry of this Department is reported. The purpose of the experiment was to compare different combinations of cotton-seed meal, cowpea hay, and wheat bran as sources of protein. Three lots of 4 cows each were fed experimentally for 4 months. The daily ration for all animals included 30 lbs. of silage. In addition, lot 1 received 4 lbs. of cotton-seed meal and 6 lbs. of wheat bran; lot 2, 4 lbs. of cotton-seed meal and 7 lbs. of cowpea hay; and lot 3, 6 lbs. of wheat bran and 13 lbs. of cowpea hay. The 3 rations furnished the same amount of protein and were satisfactorily eaten by the cows.

Lot 1 consumed 25,415 lbs. of silage, 2,880 lbs. of wheat bran, and 1,920 lbs. of cotton-seed meal; lot 2, 23,795 lbs. of silage, 3,034 lbs. of cowpea hay, and 1,920 lbs. of cotton-seed meal; and lot 3, 15,531 lbs. of silage, 4,935 lbs. of cowpea hay, and 2,880 lbs. of wheat bran. Lot 1 gained 41 lbs. and lot 2, 7 lbs. in live weight during the 4 months, and lot 3 lost 190 lbs. The milk produced by the 3 lots was, respectively, 9,134, 7,833, and 7,176 lbs., and the fat produced, 447.59, 415.15, 394.68 lbs. "It appears that all the foods were satisfactory in maintaining a good flow of milk, a high fat content, and a high percentage of total solids, and the variations shown are not definite enough to attribute the results to any material influence of the respective feeds." The digestible matter consumed by the 3 lots for the production of a gallon of milk was, respectively, 6.2, 6.5, and 7.2 lbs., and for the production of a pound of butter, 12.7, 12.4, and 13.1 lbs.

In preparing a financial statement, both high and low prices of feeding stuffs are taken into account, as well as the fertilizing value of the manure. With high prices, the net cost of milk production by the 3 lots was, respectively, 6.7, 5.6, and 8 cts. per gallon, and with low prices, 4, 3.5, and 4.4 cts. The net cost of butter production with high prices was 13.8, 10.7, and 14.5 cts. per pound, and with low prices, 8.4, 6.7, and 7.9 cts.

"The results throughout favor the combination of cowpea hay and cotton-seed meal, two rich protein-containing foods, whether high prices or low prices are considered, for milk and butter making. They indicate also that at low prices cowpea hay can be substituted for cotton-seed meal with satisfactory results, whereas this can not be done when high prices prevail." The following statement is taken from the rather extended summary of the results: "Providing the palatability and the digestibility of the foodstuffs used are equal, the source from which the protein is derived has but little effect if the substitution of one food for another is made on the basis of the protein equivalent."

Apple pomace a good feed for cows, J. L. Hills (*Vermont Sta. Bul. 96, pp. 7*).—The attention of Vermont dairymen is called to the feeding value of apple pomace for cows. In experiments at the station during 4 years this material has been tested, the results being uniformly in its favor and indicating that apple pomace has practically the same feeding value as corn silage. A brief summary is given of the experiments, which have been reported in detail in the reports of the station.

"These repeated experiments seem to be sufficient to demonstrate the value of this usually despised product. Twenty or more cows have been in four different years fed from 10 to 16 lbs. daily. Some were fed in 4-week periods, alternated with corn silage, and two were fed for 20 weeks continuously without trouble of any kind being experienced in the health of the animals or the quality of their products."

On account of unfavorable results which have been reported it is advised that a change from corn silage to apple pomace be made gradually. No special care has been observed at the station in ensiling apple pomace. The material has been dumped into the silo, leveled off, and left uncovered and unweighted until used. The station has fed 15 lbs. daily per cow with entire satisfaction.

Feeding experiments, J. S. Moore (*Mississippi Sta. Rpt. 1902, pp. 23-26*).—Johnson grass hay was compared with corn silage and with cotton-seed hulls in 2 series of experiments which are reported. Six cows were used in each test, which lasted about 10 weeks. The results are summarized as indicating that under the conditions of the experiments 20 lbs. of corn silage is equal to about 6 lbs. of Johnson grass hay and 12 lbs. of cotton-seed hulls is equal to 10 lbs. of hay.

Record of dairy herd, J. S. Moore (*Mississippi Sta. Rpt. 1902, pp. 19-22*).—This is a record of the amount and cost of food consumed and the milk and butter produced by 12 cows during the calendar year 1901. The average cost of food per cow was $34.58, the average yield of milk 5,094 7 lbs., and the average yield of butter 325.6 lbs. The average cost of food for 100 lbs. of milk was 69.7 cts. and for 1 lb. of butter 11 cts.

Some of the influences affecting milk production, L. Anderson (*Thesis, Cornell Univ., 1902, pp. 97, dgms. 13*).—The influences considered are natural environment, heredity, food, and the temperature of the cow, including oestrum and spaying. The part dealing with the influence of food was published as Bulletin 173 of the New York Cornell Station (E. S. R., 11, p. 1081). The author's investigations concerning the relation of the temperature of the cow to the secretion of milk are reported upon as a new line of study in the field of animal production. The records of the cows upon which the observations were made are given in tabular form and are also shown by means of diagrams. The conclusions drawn are as follows:

"The period of oestrum as observed with 11 cows was accompanied by little variation in the flow of milk; by a rise in butter-fat percentage in about one-half the cases and little or no change in the other half; by a variation in the total fat secreted corresponding to the variation in the percentage of fat; and usually by a rise in temperature. Each cow returned to her normal milk secretion as soon as the oestrum period had passed.

"Two cows that were spayed showed a large decrease in milk flow, a wide fluctuation in the percentage of fat, and a slight rise in temperature immediately following the operation. Both cows recovered their normal condition and flow of milk within a few days.

"The results of a study extending over a period of 214 days of record with 14 different cows indicate that there is no intimate relation between the temperature of the cow and either the percentage of fat or the total yield of fat. There appears to be no difference in this respect whether the temperature be taken only at milking time or at more frequent intervals.

"In 214 days of record the lower percentage of fat for each day occurred 62 times with the smaller yield of milk and 149 times with the larger yield of milk; 50 times at the evening milking and 164 times at the morning milking; and 108 times with the smaller yield of fat and 106 times with the larger yield of fat.

"In 214 days of record with 14 different cows and comparing the morning's with the night's milking on each day, 51.6 per cent of the total butter fat produced was secreted at the milkings containing the higher percentage of fat, and 48.4 per cent of the total butter fat was secreted at the milkings containing the lower percentage of fat."

An extended bibliography is appended.

A study of some of the salts formed by casein and paracasein with acids: Their relations to American Cheddar cheese, L. L. Van Slyke and E. B. Hart (*New York State Sta. Bul. 214, pp. 53–79*).—Introductory notes are given on the chemical changes taking place in cheese during the early stages of its manufacture, and experiments are reported the results of which are summarized by the authors as follows:

"(1) The object of the work described in this bulletin is to study the real function of acids in relation to the important changes taking place in cheese-curd during the Cheddar process of cheese-making.

"(2) In examining cheese for hetero-caseose by extraction with dilute solution of common salt, a body was found in quantities so large as to indicate that it was some compound other than hetero-caseose.

"(3) In studying cheeses made with and without the use of lactic acid, the salt-soluble product was discovered to be present in very large quantities only when acid was used, being practically absent, or present in very small proportions, when no acid was used.

"(4) In normal cheese the salt-soluble product is always found, but in varying quantities, being largest usually in new cheese, and diminishing with age of cheese. Various conditions affect the amount in new cheese, especially those conditions influencing the amount of acid present.

"(5) Paracasein, carefully prepared and treated with dilute lactic acid, furnishes a product resembling, in both physical and chemical properties, the salt-soluble substance extracted from cheese.

"(6) Paracasein is shown to combine with an acid in at least two different proportions, forming two distinct compounds; one is the unsaturated or mono-acid salt; the other, the saturated or di-acid salt. Such compounds were prepared with lactic, acetic, hydrochloric, and sulphuric acids.

"(7) Casein forms salts with acids in the same manner as paracasein.

"(8) The unsaturated salts formed by casein and paracasein with acids are soluble in dilute solutions of sodium chlorid and in 50 per cent hot alcohol, but insoluble in water. The saturated salts are practically insoluble in water, dilute salt-solutions and 50 per cent hot alcohol. Both forms are sparingly soluble in dilute solutions of calcium lactate and calcium carbonate.

"(9) The important changes taking place in cheese-curd during the process of Cheddar cheese-making, such as the acquired ability to form strings on hot iron, the changes in appearance, plasticity and texture, and probably the shrinkage, are due to the formation of the unsaturated paracasein lactate.

"(10) The ripening process in normal Cheddar cheese, by which the insoluble nitrogen-compounds change into soluble forms, begins, not with paracasein as has been universally held, but with unsaturated paracasein lactate. The water-soluble nitrogen in cheese generally increases as the unsaturated paracasein lactate decreases, and apparently at the expense of the latter compound. The first step in the normal ripening process of American Cheddar cheese is probably a peptic digestion of unsaturated paracasein lactate. Some of the facts presented suggest a method of proof of the commonly accepted theory of gastric digestion."

Milk in relation to public health, G. M. KOBER (*U. S. Senate, 57. Cong., 1. Session, Doc. 441, pp. V+235, pls. XV*).—In this document the author defines what constitutes mechanically, chemically, and bacteriologically pure milk, discusses the importance of sanitary supervision of the production and sale of milk and cream, and presents in detail in a series of articles which are appended the results of his studies of milk in relation to public health. Appendix A deals with the influence of food, breed, and season upon the composition of milk, the adulteration and preservation of milk, and standards for dairy products. Appendix B is devoted to milk inspection, milk analysis, and the methods of detecting adulterations and the preservatives of milk. Appendix C discusses the dietetic and therapeutic uses of milk. Appendix D deals with the relation of bacteria to disease. Appendix E describes the cultivation and study of bacteria. Appendix F considers the relation of impure milk to infantile mortality. Appendix G is a reprint of an article by R. A. Pearson entitled Market Milk: A Plan for Its Improvement (E. S. R., 13, p. 1083). Appendix H deals with abnormal milk and the diseases traced to this source. Two bibliographies are included and tabulated data are given for epidemics of typhoid fever, scarlet fever, and diphtheria due to an infected milk supply.

The creamery patron's handbook (*Chicago: The National Dairy Union, 1902, pp. XIX+309, figs. 110*).—This book is made up of the following articles: The National Dairy Union and Its Work for the Protection of Pure Butter Against Oleomargarine Imitation, by C. Y. Knight; The Patron and the Creamery, by W. D. Hoard; Building up a Dairy Herd, with Suggestions on Midsummer Forage Crops, by C. F. Curtiss; Selection of Cows, by C. P. Goodrich; Stable Location, Construction, and Sanitation, by H. B. Gurler; The Comparative Value of Feeds, with Tables Giving their Percentage of Digestible Nutrients, by W. A. Henry; Management of Young Dairy Stock, with a Review of Some Interesting Calf Experiments, by D. H. Otis; Economic Feeding and Care of Dairy Cows, with Instructions and Examples of how to Formulate Dairy Rations, by T. L. Haecker; Commercial Feeding Stuffs, by W. H. Jordan; Tainted or Defective Milks, Their Causes and Methods of Prevention, by H. L. Russell; Milk and Its Production for Cities and Towns, by A. W. Bitting; Milking, Cooling, and General Care of Milk for Delivery to Creamery, by E. H. Farrington; Necessity of Making Good Butter and the Farmer's Part in Its Production and Sale, by J. Kolarik; Variation in Tests—Composition of Milk as Observed at the Model Dairy at the Pan-American Exposition at Buffalo, N. Y., by DeW. Goodrich; Breeds of Cows—Views on the Building up of a Dairy Herd, by S. M. Tracy; Common Ailments of Cows and Calves, and Their Treatment, by A. H. Hartwig; Building Silos, Growing the Corn, and Making Silage, by A. W. Trow; The Physiology of Milk Secretion—With Notes on the Effects of Foods, Drugs, Exposure, Exercise, and Abnormal Bodily Condition, by A. W. Bitting; Management of Dairy Work on the Large Estate of Biltmore Farms, by G. F. Weston; and Dairy Animals of the United States as Reported upon by Twenty State Experiment Stations. A scale of points for scoring dairy animals and a ground plan of a modern creamery are also given.

Creameries in foreign countries (*Spec. [U. S.] Consular Rpts., 24 (1902), pp. IV+162, pls. 10, figs. 3*).—This contains statistics and other information relating to creameries and creamery machinery and products in the principal foreign countries.

Proceedings of the thirteenth annual meeting of the Missouri State Dairy Association, 1902 (*Missouri State Bd. Agr. Mo. Bul., 2 (1902), No. 8, pp. 75, figs. 4*).—This contains the addresses and discussions. Some of the topics treated were dairying in Missouri, the retail milk business, rations for dairy cows, silos and silage, butter making as a profession, bitter milk, the literature of dairying, and the selection of dairy cows.

VETERINARY SCIENCE AND PRACTICE.

The transference of bovine tuberculosis to man, R. Koch (*British Med. Jour., 1902, No. 2190, pp. 1885-1889*).—This is a translation of an address delivered at the International Conference on Tuberculosis in Berlin, October 25, 1902. In this address the author discusses in a critical manner the 2 outbreaks and 28 individual cases of tuberculosis in man which have been mentioned in the literature of the subject as being due to infection from eating meat or milk of tuberculous animals, or to wound infection with tuberculous material of animal origin. In R. Koch's opinion the proof of causal connection between the cases of human tuberculosis and infection from animals is wanting in every case, and while it is not denied that individual cases may arise in man from infection with milk of animal origin, it is argued that such cases must be exceedingly rare, otherwise it is believed that more numerous undoubted cases would be accessible. The author argues that if the meat and milk of tuberculous animals were virulent or generally infectious toward man, numerous outbreaks of extensive character should appear, on account of the fact that the tuberculous milk and meat in any case would naturally be eaten by a number of persons. Such outbreaks, however, have not been observed. In the case originally reported by Ollivier and subsequently quoted at frequent intervals by various writers on the subject, the author calls attention to the fact that Ollivier subsequently admitted his mistake in the original report and stated that the pupils who contracted tuberculosis had not eaten the milk of the cow which was affected with tuberculosis of the udder; the faculty of the institution, however, had eaten this milk and no cases of tuberculosis developed among them.

Are bovine and human tuberculosis identical or not? E. Klebs and Rievel (*Deut. Thierärztl. Wchnschr., 10 (1902), No. 3, pp. 21-23*).—The authors conclude from their experiments on this question that tubercle bacilli of human origin, after having been artificially cultured a long time, are capable of producing acute typical tuberculosis in calves. The tubercle bacilli of human origin are first exclusively confined to the lymphatic glands in the neighborhood of the point of inoculation; later, however, the tuberculous alterations may extend over the peritoneum and other organs.

Some experiments upon the immunization of cattle against tuberculosis, L. Pearson and S. H. Gilliland (*Philadelphia Med. Jour., 10 (1902), No. 22, pp. 842–848, figs. 4*).—In this article a summary account is given of experiments during which it was found that the subcutaneous injection of tuberculin has the influence of increasing the resistance of cows to tuberculous lung material given by way of the mouth. The more important literature upon the subject of immunizing cattle against tuberculosis is critically reviewed. This literature includes the publications of E. A. de Schweinitz, J. McFadyean, and E. von Behring.

Experiments with 2 young cattle showed that cattle may be refractory to large quantities of human tubercle bacilli when injected into the blood. One of the 2 animals upon which these experiments were made exhibited considerable resistance to a virulent culture of bovine tubercle bacilli. In March, 1902, a definite test was made of the possibility of immunizing cattle to tuberculosis by repeated intravenous inoculations of human tubercle bacilli not virulent for cattle. In these experiments 4 young cattle were used. They were tested with tuberculin and found to be free from tuberculosis, after which 2 were vaccinated with human tubercle bacilli and the other 2 were kept as control animals. The vaccinated animals received gradually increasing doses of a suspension of a culture of human tubercle bacilli. In all, 125 cc., representing about 0.16 gm. tubercle bacilli, were administered to each animal. All 4 of the animals were inoculated on July 29 following, by an intratracheal injection of 10 cc. of a suspension of bovine tubercle bacilli known to be virulent for cattle.

All of the animals were killed on different days of the following October and careful post-mortem examinations were made. Both of the control animals were found to be extensively infected with tuberculosis and exhibited fresh tubercles which were evidently in a progressive state. In one of the vaccinated animals it was found that all the organs, with the lymphatic glands and covering membranes, were free from disease, with the single exception of a slight fibrous thickening at the point of vaccination. The second vaccinated animal exhibited 2 hard globular thickenings at the point of inoculation, and within the trachael mucous membrane 2 minute grayish elevations were found, the smaller one of which contained caseous material. All the other organs were in a healthy condition.

From these experiments it is concluded that by means of repeated intravenous injections of human tubercle bacilli, the resistance of young cattle to virulent bacilli of bovine origin may be greatly increased—to such an extent, in fact, that the animals are not affected by inoculations capable of causing death or extensive infection in cattle which have not been thus protected. Intravenous injections of much larger quantities of human tubercle bacilli than are necessary to confer resistance upon the vaccinated animals may be safely given. The authors have other experiments in progress for the purpose of determining the duration of immunity thus produced and the effectiveness of the method in protecting animals against natural infection.

Is the ingestion of the meat of tuberculous animals dangerous for human beings? V. GALTIER (*Jour. Méd. Vét. et Zootech., 5. ser., 6 (1902), Jan., pp. 1–7*).—The author discusses the various conditions under which different animals may become infected with tuberculosis. In this discussion especial attention is given to the different degrees of susceptibility to the disease. Brief notes are presented on a number of experiments conducted by the author since 1891 bearing upon the question at issue. The author concludes from his experiments that regulations regarding meat inspection should be modified so as not to require the seizure and destruction of the meat of all tuberculous animals, but only the meat of animals which exhibit pronounced emaciation or extensive tuberculous lesions in the muscles and bones.

On the question of indemnity to butchers for animals found to be tuberculous after slaughter, V. GALTIER (*Jour. Méd. Vét. et Zootech., 5. ser., 6 (1902), Mar., pp. 129–143*).—The author presents a detailed discussion of this question with especial reference to the French law of July 3, 1895. Many difficulties have been found in attempts to adjust differences arising from the sale of tuberculous cattle to butchers. It is argued that all sales of cattle for butchering should be made subject to the regulations of this law and that legal contests which may arise should be settled in accordance with its provisions.

The history of a tuberculous herd of cows, C. L. BEACH (*Connecticut Storrs Sta. Bul. 24, pp. 24, figs. 6*).—This bulletin contains observations on the station herd of about 50 cows and young cattle. The herd was tested with tuberculin in 1896 and was found to be free from tuberculosis. The test was again applied in 1897, without any reaction. During 1897 a Guernsey cow was bought from a neighoring farmer. The cow did not react to tuberculin test. In the following year, however, this animal suddenly exhibited symptoms of disease. A post-mortem examination showed a case of generalized tuberculosis. The herd was then tested with tuberculin and 12 animals responded, and later 6 other animals responded to the test, making a total of 18. Five of the affected animals were killed and examined; the remainder were isolated from the healthy animals. The barn was disinfected as thoroughly as possible by means of crude carbolic acid, 1 part in 20 of water. The tuberculin test was applied to the nonreacting herd once or twice a year, and the author believes that it is necessary to test as often as this. During the further course of the experiment 93 animals were tested within 3 years. It was found that no constant differences existed among different breeds with regard to the susceptibility to tuberculosis, since 20 per cent of the Jerseys were affected, 26 per cent of the Guernseys, 21 per cent of the Ayrshires, and 20 of the Holsteins. It was found that the heavy milkers were no more susceptible to tuberculosis than the least productive cows. The evidence obtained from the herd showed that the disease is not inherited, no case of tuberculosis having appeared in 17 calves reared from the tuberculous animals. Repeated injections of tuberculin were found to produce a temporary insusceptibility to the test. Great individual differences in resistance to the progress of the disease were noted in different animals. The author believes that Bang's method of isolation is economical and effective.

Contributions to our knowledge of bovine tuberculosis, J. Nelson (*New Jersey Stas. Rpt. 1901, pp. 352–381*).—Notes are given on autopsies on 2 cows which were affected with tuberculosis. Extensive tables are presented showing the variations in temperature of tuberculous cattle from February to June, and also showing the record of abortions in the college herd. It is stated that the number of abortions is decreasing, but the cause is not well understood. The record of temperatures of tuberculous cattle in the hospital herd fails to indicate that specially favorable conditions for infection are found in the stables where the animals are kept.

The use of eggs as a medium for the cultivation of Bacillus tuberculosis, M. Dorset (*Amer. Med., 3 (1902), No. 14, pp. 555, 556*).—During the author's experiments a medium consisting chiefly of hens' eggs prepared in 3 ways so as to include the whole egg content, the yolk of the egg alone, or simply the white alone, was tested. Unusually rapid development of the tubercle bacilli took place on these nutrient media, especially on the whole egg medium. Growth was usually quite apparent by the end of 7 or 8 days, and conspicuous colonies of bacilli were to be observed after a lapse of 10 to 14 days. The egg medium possesses the advantages of causing the rapid growth of the tubercle bacillus and of being easily prepared. It does not cause quite so rapid and abundant growth as secured by Ficker from pure cultures on brain medium.

Treatment of anthrax, Möbius (*Berlin. Thierärztl. Wchnschr., 1902, No. 14, pp. 206, 207*).—The author calls especial attention to a number of cases of anthrax in man which have arisen from carelessness in handling the carcasses of animals dead of anthrax, or from unnecessary inspection or examination of these carcasses. It is recommended that no dissection or other examination of animals dead of anthrax should be made, after diagnosis is fairly certain. This recommendation is made on account of the great danger of becoming infected with anthrax, even when only the most minute skin lesions are to be found on the hands.

Recovery of a cow from anthrax, W. Ortmann (*Berlin. Thierärztl. Wchnschr., 1902, No. 8, p. 125*).—One animal in a small herd of cattle died of anthrax, and on the next day another cow manifested similar symptoms. In the treatment of this case the author used intravenous injections of colloidal silver, and administered 1 spoonful of lysol in a bottle of water hourly; after 2 days, naphthaline, bicarbonate of soda, and gentian root were administered. Complete recovery took place.

The intravenous application of corrosive sublimate, Schmidt (*Berlin. Thierärztl. Wchnschr., 1902, No. 12, pp. 181–184*).—The author couducted a number of experiments, for the most part on small experimental animals, which were infected with anthrax and fowl cholera. As the result of these experiments it was found that the injections of corrosive sublimate did not produce any general reaction of the experimental animal, except when very large doses were used. The pulse, temperature, and respiration remained unchanged. Solutions as strong as 0.5 per cent may produce local irritation; it is recommended, therefore, that this drug be used in very dilute solutions. The condition known as mercurialism may appear after injections of corrosive sublimate. The best place for making the injection is considered to be the jugular vein. Animals which received 5 injections inside of 14 days did not exhibit any alteration in the tuberculous processes with which they were affected.

A fatal case of induced Texas fever, C. F. Dawson (*Amer. Vet. Rev., 26 (1902), No. 2, pp. 124–126*).—A detailed description is given of a fatal case of Texas fever in an immune Southern animal. The acute and finally fatal symptoms were apparently brought about in consequence of a shock received by the operation of dehorning. Two other steers dehorned at the same time appeared to be slightly affected in the same way, but recovered, while yearlings did not develop any symptoms of the disease. These cases are believed to add another reason to those which already exist for performing the operation of dehorning at an early age.

Observations on Bacelli's method of treating malignant foot-and-mouth disease, Koske (*Berlin. Thierärztl. Wchnschr., 1902, No. 10, pp. 145–150*).—A critical review of the extensive literature on this subject is presented by the author. The large number of experiments conducted by various authors are brought together in a tabular form for the purpose of showing the conditions and results of these experiments. The author concludes from the results of the experiments of others, as well as from his own observations, that, when all conditions surrounding the reported cases of foot-and-mouth disease treated by this method are considered, no influence can be ascribed to the injection of corrosive sublimate. This drug, when injected intravenously, did not prevent an outbreak of the disease, or an unfavorable course in cases which were treated by the author.

The treatment of foot-and-mouth disease, Weinsheimer (*Deut. Thierärztl. Wchnschr., 10 (1902), No. 16, pp. 153–155*).—In outbreaks of this disease the author believes that the most important operations are immediate removal of affected animals, and nutritious dieting of animals which have been exposed. For the purpose of preventing the disease it is urged that susceptible animals be rendered as resistant as possible by keeping them in a healthy and well nourished condition, and that the virus of foot-and-mouth disease be kept attenuated or be destroyed by abundance of fresh air and direct sunlight.

Bovine eczema, C. Bregeard (*Jour. Méd. Vét. et Zootech., 5. ser., 6 (1902), Feb., pp. 95, 96*).—A brief note on the treatment of this disease with a solution of nitric acid in water in a proportion of 1 to 10. The remedy was frequently applied to the affected parts and the results were very satisfactory.

Abortion in cows, P. Malcolm (*Amer. Vet. Rev., 26 (1902), No. 2, pp. 127–130*).—The usual factors and conditions which are important in bringing about cases of abortion are enumerated. In case of abortion the author recommends burning or otherwise destroying the fetus and fetal membranes, and disinfection of the stable. It is not believed that the treatment with antiseptic washes as usually applied to cows is of any value in preventing the development of this disease.

Infectious pneumonia of calves, H. Marder (*Berlin. Thierärztl. Wchnschr., 1902, No. 7, p. 110*).—It is reported that this disease has been observed in calves in the form of a plague on several occasions. The disease seems to break out in summer as well as in winter. Medicinal treatment was in all cases without good result. It is recommended that all healthy animals be immediately isolated from the diseased and suspected ones, that the stables in which the diseased calves have been confined be torn down and used for fire wood, and that the superficial layer of the soil around and underneath such stables be removed and the surface treated with chlorid of lime or a similar disinfectant.

Treatment of sheep scab, Nagel (*Deut. Thierärztl. Wchnschr., 10 (1902), No. 1, pp. 3–5*).—A number of experiments were conducted for the purpose of testing the value of a creolin dip in the treatment of sheep scab. The author calls attention to the necessity of careful local treatment of the affected parts, to maintaining proper temperature of the dip, and to proper treatment of the sheep between the first and second dipping. It was found not to be necessary to rub affected parts of the skin with carbolized soap before dipping. After dipping, however, it is believed to be desirable that the scab areas be vigorously rubbed with a brush in order to bring the creolin in contact with all the scab mites. The author found a 2.5 per cent creolin dip to be a thoroughly reliable dip for destroying scab mites.

Experiments with Bacillol sheep dips. K. Kasselmann (*Deut. Tierärztl. Wchnschr., 10 (1902), No. 13, pp. 121, 122*).—The author tested this dip on 1,200 sheep, and obtained results which indicate that it is quite as effective as creolin, or perhaps somewhat better. No symptoms of poisoning were observed in sheep after being dipped in Bacillol. This remedy is therefore considered a valuable sheep dip of harmless nature, and it is stated that it can be obtained conveniently for a reasonable price.

The Landsberger Swine Erysipelas Serum. B. Schubert (*Berlin. Tierärztl. Wchnschr., 1902, No. 19, pp. 289–293*).—Extensive experiments were conducted, during which the effect of Susserin, Lorenz Serum, and Landsberger Serum were compared. These experiments were conducted in various cities of the German Empire and under various conditions. From the consideration of the literature of the subject and the author's own observations, it is concluded that a mixture of several active immune sera is of distinct advantage in producing immunity. The Landsberger Swine Erysipelas Serum differs from all previously known swine erysipelas sera; it is a multivalent serum, i. e., a mixture of immune sera obtained from different species of animals. This composition gives the Landsberger Serum an advantage, and even in small doses it exercises a more rapid and powerful action than any simple serum.

Results of vaccination with Septicidin for swine plague and hog cholera in the year 1901. Schreiber (*Berlin. Tierärztl. Wchnschr., 1902, No. 9, pp. 131, 132*).—Reports received for the year 1901 regarding vaccination experiments with this substance show that 6,224 animals were vaccinated. Of this number, 2,943 were inoculated for purposes of protection. Of the animals already affected, 64.02 per cent were cured by vaccination. Vaccination experiments were conducted upon a herd of hogs in which, at the time of vaccination, the rate of mortality was 53.42 per cent. After vaccination, the death rate fell to from 3 to 5 per cent.

A report of vaccination in the year 1901 with the vaccine from the Swine Erysipelas Institute at Prenslau. Helfers (*Berlin. Tierärztl. Wchnschr., 1902, No. 15, p. 233*).—It is stated that the Swine Erysipelas Institute at Prenslau distributed 500,000 doses of vaccine during the year 1901. Reports have been received covering the results from 163,098 animals vaccinated. Of this number, 157 became infected with swine erysipelas and 87 died. The number of deaths from swine erysipelas in consequence of vaccination was 0.019 per cent, and the number of deaths from the same disease in spite of vaccination was 0.033 per cent.

Report on the vaccinations made in the Province of Saxony in the year 1901–2 with the Lorenz vaccine. H. Raebiger (*Berlin. Tierärztl. Wchnschr., 1902, No. 20, p. 301*).—The number of hogs vaccinated during the year in the Province of Saxony with Lorenz vaccine amounted to 70,000. In 1900 the number was 24,000. It is stated that the results obtained from the use of this vaccine have been so satisfactory that the Institute has undertaken to guarantee indemnity for any loss which may be incurred in consequence of the use of the Lorenz vaccine. The percentage of recovery when the vaccine is used for therapeutic purposes is stated to be between 70 and 75 per cent.

The necessity and the method of observing a uniform technical procedure in trichina inspection. Weber (*Deut. Tierärztl. Wchnschr., 10 (1902), No. 2, pp. 13–16*).—The author presents arguments showing the necessity of careful practice of inspection for trichina. It is argued that the method of making this inspection should be uniform instead of uncertain and defective, as it is at present in many governmental districts. Attention is called to the necessity of special training, careful examination, and supervision of the trichina inspectors.

The transmission of glanders, and danger of accidental inoculation to which human beings are subjected, V. Galtier (*Jour. Méd. Vét. et Zootech., 5. ser., 6 (1902), Apr., pp. 197–210*).—Detailed notes are given on the usual means by which glanders is communicated from one animal to another, under natural conditions. The various forms of glanders are discussed. A large number of experiments were made in placing glanderous material upon the uninjured conjunctiva of guinea pigs. During these experiments it was found that a perfectly healthy and intact conjunctiva could absorb the virus of glanders. The more bacilli present in the virus used in these experiments, the more certain was the infection. It was found that by washing the eye after contaminating the conjunctiva the infection could be prevented. No antiseptics need be used for this purpose, since water appeared to serve equally well to prevent the entrance of the glanderous bacilli into the eye. The application of these results to accidental contamination of the human eye with glanderous material is apparent. If the virus of glanders is thrown into the eye by the violent sneezing or coughing of glanderous horses, the careful washing of the eye will prevent the contraction of glanders.

Treatment of azoturia with potassium iodid, T. S. Childs (*Amer. Vet. Rev., 26 (1902), No. 3, pp. 219–223*).—Good results are reported from the use of potassium iodid in the treatment of a number of cases of azoturia. This chemical was injected into the bladder in doses of ½ oz. or more in ½ pt. of water. The dose may be repeated if necessary. The favorable action of the drug was usually observable within a short time, and complete recovery in nearly all cases took place after from 3 to 6 days. The author states that several other veterinarians have used this method of treatment with varying results. Some of them had entirely negative results, potassium iodid apparently exercising no beneficial action whatever; in other cases good results were obtained. The discrepancy in the results of different veterinarians appears difficult of explanation. It is suggested that the disease may vary somewhat in virulence or otherwise in different climates.

Surra, J. J. Vassal (*Rev. Agr. Réunion, 8 (1902), No. 5, pp. 220–225*).—The symptoms, pathological anatomy, and etiology of this disease are briefly discussed and compared with those of other closely related diseases. Notes are also given on the animals which are subject to the disease. These include monkeys, horses, donkeys, mules, goats, sheep, cattle, buffaloes, camels, elephants, dogs, cats, rabbits, guinea pigs, and rats.

The tsetse fly disease, A. Proost (*Rev. Gén. Agron. [Louvain], 11 (1902), No. 5, pp. 266, 267*).—This disease is compared with surra. Brief notes are given on the habits of *Tabanus tropicus*, which carries the parasite of surra, and *Glossina morsitans*, which is the insect agent in the transmission of Nagana.

South African horse disease, Rickmann (*Berlin. Thierärztl. Wchnschr., 1902, No. 1, pp. 4, 5*).—The literature of this subject is briefly discussed by the author. It is believed that the spread of this disease depends strictly upon the agency of insects in carrying the blood parasites, and that the insects thus concerned can not become infected without previously sucking the blood from a diseased horse.

Critical notes on the treatment of colic in horses, Witt (*Berlin. Thierärztl. Wchnschr., 1902 No. 4, pp. 61–63*).—More than 1,000 cases of colic were treated by the author by means of barium chlorid, which was injected into the jugular vein in doses of from ½ gm. to 3 gm. Some horses appear to be particularly susceptible to the action of this drug, and with these it must be given in small doses. In the majority of cases the author reports better results from the use of barium chlorid than from any other treatment for this disease.

The pathology and differential diagnosis of infectious diseases of animals,

V. A. Moore (*Ithaca: Taylor & Carpenter, 1902, pp. XIV+380, pls. 8, figs. 73*).—The present volume contains a general account of etiology and infection in connection with the more important infectious diseases of animals. Special chapters are devoted to the following subjects: Diseases caused by Streptococci; diseases caused by organisms of the genus Bacterium; diseases caused by bacilli; diseases caused by higher fungi; diseases caused by Protozoa; infectious diseases of unknown cause, and a few diseases caused by animal parasites. Brief notes are also given on the approved methods of disinfecting stables and premises after outbreaks of infectious diseases.

AGRICULTURAL ENGINEERING.

The scope and purpose of the irrigation investigations of the Office of Experiment Stations, E. Mead (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1901, pp. 417–436, pls. 4*).—A brief discussion of the work of the Office in relation to irrigation in the arid and humid regions and the insular possessions of the United States, with an explanation of the need of reform in irrigation laws and a list of all the publications of the Office on irrigation.

Operations at river stations, 1901 (*Water Supply and Irrig. Papers, U. S. Geol. Survey, Nos. 65, pp. 334; 66, pp. 188*).—Tabulated daily and monthly discharge during 1901 of a large number of streams are reported. The material is divided into two parts, the first relating to the eastern portion of the country and the second to the western. The first includes measurements of 10 streams in Maine and 8 streams in other parts of New England, streams in the St. Lawrence River drainage basin, Upper Hudson River drainage, Lower Hudson River and Long Island Sound drainage, Lake Ontario drainage, Mohawk River drainage, Middle Atlantic Coast drainage, Southern Atlantic Coast drainage, Eastern Gulf drainage, Eastern Mississippi River drainage, and Great Lakes drainage. The second includes measurements of the Hudson Bay drainage, Upper Missouri River drainage, Platte River drainage, Kansas River drainage, Arkansas River drainage, Western Gulf drainage, Colorado River drainage, Interior Basin drainage, Columbia River drainage, Northern Pacific Coast drainage, San Francisco Bay drainage, and Southern California drainage.

Pumping water for irrigation (*Forestry and Irrig., 8 (1902), Nos. 1, pp. 43, 44, figs. 2; 2, pp. 83–86, figs. 3; 3, pp. 130–133, figs. 4; No. 4, pp. 176, 178, figs. 2*).

Municipal engineering and sanitation, M. N. Baker (*New York and London: The Macmillan Co., 1902, pp. VIII+317*).—The author states that this book "is designed to be a review of the whole field of municipal engineering and sanitation, rather than an exhaustive study of one or a few branches of the subject. The most vital points, however, under each class of activities and interests have been dwelt upon, the underlying principles stated, and, in many instances, details from actual practice given." It treats of ways and means of communication; municipal supplies; collection and disposal of wastes; protection of life, health, and property; and administration, finance, and public policy.

Cane cutting machinery in Australia (*Hawaiian Planters' Mo., 21 (1902), No. 4, pp. 174, 175*).—Preliminary trials of a mechanical device for cutting cane invented by Herbert Paul are briefly reported.

Oil for roads, O. W. Longdon (*Hawaiian Planters' Mo., 21 (1902), No. 5, pp. 214–217*).—A brief account of the use of crude petroleum in road making at Los Angeles, Cal.

MISCELLANEOUS.

Annual Report of the Office of Experiment Stations, 1901 (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1901, pp. 489, pls. 41*).—This contains a report on the work and expenditures of the agricultural experiment stations in the United States for the fiscal year ended June 30, 1901, including brief abstracts of all station publications received and statistics relative to organization, expenditures, etc.; reports of the experiment stations in Alaska, Hawaii, and Porto Rico, noted elsewhere; and a review of the irrigation and nutrition investigations of this Office, also noted elsewhere.

Fifteenth Annual Report of Kansas Station, 1902 (*Kansas Sta. Rpt. 1902, pp. XXXIII+251-255*).—This contains the organization list of the station; a financial statement for the fiscal year ended June 30, 1902; a list of station publications; a review of the work of the different departments during the year; an account of the establishment of the Fort Hays branch station, with a statement of the lines of work in progress; text of the State law relating to the destruction of gophers and prairie dogs, with notes on the work done along this line; and an account of cooperative experiments in range improvements.

Fifteenth Annual Report of Mississippi Station, 1902 (*Mississippi Sta. Rpt. 1902, pp. 35*).—This contains the organization list of the station, a financial statement for the fiscal year ended June 30, 1902, and reports of the director and heads of departments. Reprints of bulletins 69-77 of the station on the following subjects are appended: Texas fever (E. S. R., 13, p. 995); records of station cows, feeding dairy cows (E. S. R., 13, p. 984); milk fever (E. S. R., 13, p. 995); anthrax (E. S. R., 13, p. 994); tick fever or murrain in Southern cattle (E. S. R., 14, p. 397); some mosquitoes of Mississippi and how to deal with them (E. S. R., 14, p. 375); strawberry culture in Mississippi (E. S. R., 14, p. 356); beef cattle (E. S. R., 14, p. 483); and analyses of commercial fertilizers (E. S. R., 14, p. 558).

Annual Report of New Jersey Stations, 1901 (*New Jersey Stas. Rpt. 1901, pp. XI+587*).—This includes the organization lists of the stations, a financial statement of the State Station for the year ended October 31, 1901, and of the College Station for the fiscal year ended June 30, 1901; a report of the director reviewing the different lines of station work; and reports of the chemists, assistant in soil chemistry and bacteriology, assistant in horticulture, assistant in dairy husbandry, biologist, botanist, and entomologist noted elsewhere.

Sixth report of extension work, J. Craig (*New York Cornell Sta. Bul. 206, pp. 125-156, figs. 10*).—This report covers the period from January, 1900, to July, 1902, and is in continuation of the report published as Bulletin 159 of the station (E. S. R., 10, p. 1098). It deals with the work of instruction and investigation carried on by the college of agriculture and the experiment station under the provisions of the State law relating to the promotion of agricultural knowledge. Special reports by those cooperating in the work are included as follows: The Nature Study Movement, by L. H. Bailey; Junior Naturalists—the Work with the Children, by J. W. Spencer; Lectures in Nature Study, by Anna B. Comstock; Home Nature Study Course, by Mary R. Miller; Cooperative Experiments in General Agriculture, by J. L. Stone; Work of the Entomological Division, by M. V. Slingerland; and Dairying and Animal Industry, by H. H. Wing.

A review of the foreign literature relating to agriculture, soil management, and plant culture for the year 1900, T. Westermann (*Separate from Tidsskr. Landbr. Planteavl, 8 (1902), pp. 147*).—References, extracts, and summaries are given of a large amount of the literature relating to the topics indicated in the title. The titles are arranged alphabetically by authors under the different chapters, the principal ones being air and soil, soil improvement and management, chemical composition, nutrition, and improvement of agricultural plants, plant culture arranged by crops, agricultural education, experiment stations, etc.

Yearbook of the natural sciences, 1901-02, M. Wildermann (*Jahrb. Naturw., 17 (1901-2), pp. 533, figs. 52*).—This volume contains brief abstracts of the more important literature published during the past year on physics, chemistry, applied mechanics, meteorology, physical geography, astronomy, mathematical geography, zoology, botany, forestry, agriculture, mineralogy, geology, anthropology, ethnology, sanitation, medicine, physiology, and industrial technology.

NOTES.

Alaska Station.—C. C. Georgeson, director, is spending a few weeks in Washington. R. W. De Armond, a graduate of the Kansas Agricultural College and recently a student assistant in horticulture, has been appointed horticulturist, and will be located at Sitka. His appointment will take place April 1. It is planned to make Sitka more especially a horticultural station for experiments with fruit and the propagation of plants for distribution. Ten varieties of apples thought to be specially promising for that locality have been set out, and experiments will be made in grafting on the native crab as a stock. Work will also be carried on in the improvement of the native fruits, especially the cranberries, raspberries, and strawberries.

California University.—J. M. Wilson, assistant professor on irrigation, and in charge of the Pacific Coast division of the irrigation work of this office, died January 27, after an illness of several months.

Idaho University and Station.—Lowell B. Judson, a graduate of Harvard and for two years a special student in horticulture at the Michigan Agricultural College, has been appointed horticulturist of the university and station.

Illinois University and Station.—Hugh E. Ward, chief assistant in soil bacteriology, died of heart disease December 29. He had been granted a year's leave of absence for study in Europe, but after spending a few weeks at Zurich he was compelled by failing health to return home, where he died ten days after his arrival.

Maryland Station.—T. M. Price, assistant chemist of the station, has resigned to accept a position as scientific assistant in the Bureau of Animal Industry.

Missouri Fruit Station.—J. T. Stinson, director, has resigned to accept the position of superintendent of pomology in the department of horticulture of the Louisiana Purchase Exposition.

Oklahoma College and Station.—J. S. Malone, assistant in animal husbandry, has resigned and accepted a position as manager of a 2,500-acre farm in the vicinity of Oswego, Kans. There are 22 students in the short course in agriculture, horticulture, and mechanic arts, and 20 in the short course in domestic economy. Several were turned away for lack of space.

Tennessee Station.—Andrew M. Soule, agriculturist and vice-director of the station, has been elected director. Some important digestion experiments have been undertaken by the chemical department.

Wyoming Station.—The completion and occupation of the new Science Hall has enabled the board of trustees to grant more room in the main university building for the station headquarters. The south end of the building (main floor) has been assigned to the director and agriculturist with his assistants. This furnishes office rooms and additional laboratory space, and the library of the experiment station and agricultural department is shelved where it will be more accessible and convenient.

Concentration Schools in Canada.—Through the munificence of Sir William Macdonald, of Montreal, the experiment of consolidated schools, in which the principles of agriculture will be taught, is to be tried in each of the five eastern provinces of Canada, The details of this experiment are in the hands of Prof. James W. Robertson, of Ottawa. The plan is to unite the rural schools in a district and to convey the children to a central school. For the present, one school is planned for each of the eastern provinces. In these central schools, besides the usual subjects of the

8 grades and possibly the high school, domestic economy, manual training, and nature study will be taught. Under the direction of Professor Robertson eleven Canadian teachers have been sent to this country for a 6 months' course in science and agriculture, after which they will go to the agricultural college at Guelph for a further course of 2 months. Five of these men will then act as principals of the 5 consolidated schools and teach the nature study. In addition to these schools, there is to be a traveling inspector in nature study in each province, who will visit a group of 5 of the ordinary schools of the province, which are separate and apart from the consolidated schools but which are regarded as prospective centers for consolidated schools. Each of these 5 schools will be visited once a week and instruction given in school garden work and nature study. The consolidated schools and the schools visited by the traveling inspectors will each be provided with school gardens. It is proposed to begin work on this plan next September with the opening of the school year. Sir William Macdonald bears the expense for 3 years, over and above what the same schools are now costing, and the whole work will be carried out under the regularly appointed educational authorities.

RURAL EDUCATION IN FRANCE.—In a paper on French rural education, read before the Society of Arts, and reported in *Nature*, Cloudesley Brereton explained the part taken by the primary and secondary schools in the agricultural education of the nation. In France in some communes one person in every four is a land proprietor, and the aim in the primary schools has been to give the pupils some grasp of the principles underlying the science of agriculture. The teacher is not expected to follow rigidly the departmental programme, but to choose those portions which best suit the particular district. The teachers in these schools are trained by professors of agriculture in the training colleges. There is still some doubt among French authorities on education whether the scientific or the agricultural side of the instruction should predominate in primary schools. In the secondary schools of France agricultural education has an insignificant place, although the work done by means of lectures and evening classes conducted in connection with clubs and other organizations is important.

PROPAGANDA FOR THE RATIONAL USE OF FERTILIZERS IN ITALY.—A voluminous report has been received on this work, which is carried on by a section of the Italian Federation of Agricultural Societies. This federation was organized in 1892, but the section on fertilizers was not formed until 1898. The objects of the propaganda are to encourage the establishment of experimental and demonstration fields to test fertilizers, to disseminate information relating to fertilizers by means of publications of various kinds, to answer inquiries relating to fertilizers, and to hold public meetings to discuss the subject. The report is the first which has been issued on the propaganda, and covers the period from 1898 to 1901, inclusive. The results of a large number of cooperative experiments on a great variety of crops in different parts of Italy during the last 4 years are reported in detail, and their practical value and application are discussed, with instructions for carrying on such experiments.

INTERNATIONAL DAIRY CONGRESS.—The Societé Nationale de Laiterie of Belgium has requested the holding of an international dairy congress at Brussels in September, 1903, immediately after the eleventh congress of hygiene and demography. The questions proposed for the consideration of the congress are the suppression of fraud in the dairy industry, the hygiene of milk and its products, and the creation of an international dairy association. Opinions relating to the movement are requested, communications to be addressed to Arm. Collard Bovy, general secretary of the Societé Nationale de Laiterie, Square Marie-Louise, 56, Brussels.

ELECTRICITY AND RAIN MAKING.—The following item comes somewhat round about, being copied from an English newspaper by the *Agricultural Journal and Mining Record*, of Natal. The item states that some interesting experiments for the artificial production of rain by means of electricity have just been carried out in Japan. Waves of electricity directed skyward under a system somewhat similar to that upon which wireless telegraphy is based have resulted in atmospheric disturbances of far greater area than any ever artificially produced through the medium of detonating explosives in the upper air strata. The probability of achieving greater success in rain making through the means of electricity than by the use of explosives has been urged by scientists for several years. This attempt by the Japanese, however, is the first practical effort to prove the truth of the theory. It was attended by conspicuous success. Operations were commenced at 11 in the evening, but there was no sign of atmospheric change until 9 o'clock next morning, when a cluster of clouds was observed over the hill on which the experiment was held. At length rain began to fall, followed by a second fall at 11 a. m., and afterwards a third, fourth, and fifth, the last being about 9.30 in the evening. The area upon which the rain fell extended over many miles.

THE NILE DAM AT ASSUAN.—The great irrigation dam at Assuan was opened with much ceremony in December last. This dam, the largest of its kind ever constructed, will, according to *Nature*, hold up the waters of the Nile for a distance of 147 miles. It is a mile and a quarter long, constructed of solid granite and cement upon a natural bed of granite, over which the river flows. It is 82 ft. high, 80 ft. thick at the base, and 24 ft. at the top. There are 140 lower openings, 23½ ft. high by 6 ft. wide, and 40 upper openings, provided with doors so hung and balanced that they can be raised and lowered with little labor. Through these openings the Nile water will flow in time of flood, carrying with it the sediment that may have accumulated when the gates were closed. As the flood waters diminish the gates will be closed and the water impounded, to be taken out in such quantities as are required for irrigation during the summer months. For the accommodation of navigation a canal 50 ft. wide and 1 mile long has been cut through the rocks, and a lock constructed for a descent of 59 ft. in four drops. For the further regulation of the water another dam has been constructed 330 miles down the river to control the irrigation below that point. The most perfectly irrigated lands in Egypt command a rental equal to about $25 an acre, while the imperfectly irrigated land is not worth more than $5 an acre. About one-third of Egypt, or some two million acres, is yet undeveloped. It is estimated that the rental value will be increased nearly $30,000,000 a year by an effective system of irrigation.

NECROLOGY.—A. Millardet, who occupied the chair of botany in the faculty of science in the University of Bordeaux for 25 years, died early in December, 1902. Upon his arrival at Bordeaux from the University of Nancy, the vineyards of Bordeaux were suffering from the ravages of phylloxera, and he at once began the investigation of that pest, studying its life history and means for preventing injury. It is claimed that he was the first to point out the resistance of American grapes to phylloxera and to suggest their use as stock upon which to graft the European varieties. During this investigation he became interested in the fungus diseases of the grape, particularly the downy mildew, black rot, and anthracnose, and accidentally discovered the value of copper salts in preventing the development of the fungi. In collaboration with U. Gayon he discovered the value of the fungicide now known everywhere as Bordeaux mixture. To M. Millardet is due the credit for the first systematic trial of this fungicide in well-planned experiments, the results of which were published in 1885. M. Millardet retired from active work in the University of Bordeaux during the past year, and had been devoting himself to the reestablishment of vineyards in the calcareous soils of Saintonge, near Bordeaux.

Antoine Ronna, the eminent engineer, died at Paris November 25, 1902. He was born in London, December 9, 1830, his father being an Italian refugee, his mother the daughter of an English clergyman. He was educated in Italy and France, and at different times during his life held important scientific and official positions in

England, France, and Austria. He was an accomplished linguist and his knowledge of languages was of great service to him in the prosecution of his scientific studies and inquiries. He made valuable contributions to agricultural science, his first published work of importance in this respect being a study of the manufacture and use of phosphate of lime in England, which appeared in 1864. His reputation, however, rests mainly on his contributions to irrigation and sewage disposal as embodied in his exhaustive treatises on these subjects (1874 and 1888–89). He was also the author of important publications on agricultural industries (1869), the agricultural investigations of Rothamsted (1877) and Woburn (1886–1888), the wheat industry in the United States (1880), and numerous smaller articles on agricultural subjects.

The death is announced of N. Sibirtzev, one of the foremost of the soil investigators in Russia and professor of "pedology" or the science of soils in the Agricultural and Forestry Institute of Novo-Alexandria. He was the most prominent pupil and collaborator of Prof. V. V. Dokouchayev, who organized the soil work in Russia and founded a new school of soil investigation. Professor Sibirtzev's most notable contribution to the subject was a genetic or natural classification of soils, which, in the study of soil formations, differentiates between the parent rock species and the cultivated horizon. An account of Sibirtzev's soil investigations and his classification, taken from his memoirs, appeared in volume 12 of this journal.

Dr. G. Thoms, professor of agricultural chemistry at the Polytechnic Institute of Riga and director of the experiment station at that place, died November 2, 1902, at the age of sixty years. Professor Thoms was made director of the Riga station, the oldest station in Russia, in 1877. He reorganized and developed the station and under his direction it became an important factor in the development of the agriculture of the Baltic region. One of his chief lines of work was his extensive soil investigations and these led him to studies in plant nutrition and the use of fertilizers on a practical scale. He was very active and energetic and enjoyed the confidence of progressive agriculturists and managers of estates to an unusual degree. Professor Thoms visited this country on two different occasions. In 1868, with several other chemists, he established a factory for making beef extract in western Texas. The factory was subsequently burned and the enterprise abandoned. In 1893 Professor Thoms returned to America and visited a number of our agricultural institutions. He was a great admirer of America, and had followed the work of our agricultural experiment stations unusually closely.

MISCELLANEOUS.—At the recent meeting of the Society for the Promotion of Agricultural Science, William Frear was elected president and F. M. Webster secretary-treasurer for the succeeding year.

The officers elected by the Association of Economic Entomologists are as follows: President, M. V. Slingerland; first vice-president, C. M. Weed; second vice-president, H. Skinner; secretary and treasurer, A. F. Burgess.

During the International Live Stock Exposition in Chicago a life-size oil painting of Prof. W. A. Henry was hung in the so-called Hall of Fame in the new Live Stock Record Building. The portrait is an excellent likeness of Professor Henry, and is a present from the many students who have profited by his teachings in Wisconsin. It is the first contribution to a proposed gallery of men conspicuous for their labors in behalf of the live-stock industry in the United States.

The announcement has been received of the Columbia School of Poultry Culture at Waterville, N. Y. This is a correspondence school carried on under the direction of Dr. A. A. Brigham, formerly of the Rhode Island College and Station, assisted by 4 other experts in poultry. The course of instruction is planned to cover a year and includes plans for poultry buildings and practical advice.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*

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Chemistry, Dairy Farming, and Dairying—The Editor and H. W. Lawson.
Meteorology, Fertilizers and Soils (including methods of analysis), and Agricultural Engineering—W. H. Beal.
Botany and Diseases of Plants—Walter H. Evans, Ph. D.
Foods and Animal Production—C. F. Langworthy, Ph. D.
Field Crops—J. I. Schulte.
Entomology and Veterinary Science—E. V. Wilcox, Ph. D.
Horticulture—C. B. Smith.
With the cooperation of the scientific divisions of the Department.

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EXPERIMENT STATION RECORD.

Vol. XIV. March, 1903. No. 7.

The first report of the bureau of agriculture of the Philippine Islands, by Prof. F. Lamson-Scribner, has just been published as a part of the report of the United States Philippine Commission. Although it represents only five or six months' service in the islands, it shows that good progress has been made in organizing the new bureau, laying out its work, and getting into contact with the more enlightened class of its constituents. Besides the chief of the bureau, the staff includes a botanist and assistant agrostologist; experts in soils, tropical agriculture, plant culture and breeding, and farm management; a superintendent of the San Ramón farm, a chief clerk, a translator, an artist, and clerical assistants. A fiber expert was appointed and served for a time, but has since resigned, and an expert in animal industry is contemplated.

The experiment stations and farms established or projected under the Spanish Government have been visited by representatives of the bureau, to determine their condition and suitability for experimental work. "In general it was found that buildings, where any had ever existed, had been destroyed or had greatly deteriorated, and that farm machinery, tools, etc., had been stolen or scattered or had become useless through neglect. In some instances tracts of land selected by the Spanish Government were found to be well suited for the purposes for which they were intended, while in other cases they were so badly situated as to suggest the advisability of their final abandonment."

Work has been carried on during the season at one of these farms located at San Ramón, in the district of Zamboanga, island of Mindanao. The cocoanut groves and abacá fields, as well as the farm generally, were found in a deplorable condition, due to the long period of neglect. The cultivated area has been put in excellent condition. There are now nearly nine thousand cocoanut trees on the place, some six hundred of which are in bearing, and thirty thousand plants of Manila hemp were set out during the season. The farm has over a thousand cacao trees, but these were stung during the season by an insect which destroys the beans. Although at present rather isolated, it is thought that the San Ramón farm offers unusually good opportunities for demonstrating the income-producing power of the lands of the islands by the growth of staple crops.

Field work has been undertaken in Batangas Province, at the request and with the cooperation of General Bell, the object being to demonstrate the practicability of using American machinery, and the growing of forage plants and certain staple crops, such as cotton, tobacco, sugar cane, etc., according to American methods. At Baguio, on the island of Mindoro, experiments were made in the cultivation of American vegetables and forage crops, and the location studied with reference to the establishment of an experiment station for the growing of extra-tropical crops and the possible site of a botanical garden. This locality is thought to offer unexcelled advantages for experimental work with plants, the climate admitting of the growing of a great variety of tropical, subtropical, and temperate-zone plants.

The improvement of the native and cultivated plants of the islands and the introduction of new kinds or varieties quite naturally suggested itself as a profitable line of work. The bureau distributed over 18,000 packages of seeds, representing a great variety of field and garden crops, to a selected list of 730 individuals to test their adaptability, and is collecting seeds of the economic plants of the islands for experimental cultivation with a view to improvement. A new species of wild grape has been discovered in the island of Negros, which it is thought may prove of great value for the ultimate development of a race of grapes adapted to the region. The islands have heretofore produced no grapes, except a very limited quantity grown in the city of Cebu.

With the exception of the mango the fruits of the region have been practically wholly neglected in the past. Such tropical fruits as bananas and pineapples and the extra-tropical citrus fruits, are wholly undeveloped in the islands, although the conditions of the soil and climate are generally adapted to the growth of bananas and pineapples, and, in selected localities, to oranges and other citrus fruits. "Improved varieties of orange and lemon brought from California are flourishing both in the lowlands and in the mountains of Benguet, while pear, peach, apricot, and plum trees have been successfully introduced in the latter region."

An experiment station for the growing of rice upon a large scale will be established near the center of the great rice-producing area, extending from Manila to Dagupan.

The fiber industry of the islands has received considerable attention, and in addition to a report upon the fiber investigations, a preliminary survey is noted of the soils of the principal region supplying Manila hemp.

One of the greatest drawbacks to agriculture in the islands at present is the lack of draft animals. Rinderpest has been very prevalent and destructive among the carabaos, or water buffaloes, which are the main reliance for farm work, and glanders and surra have caused serious losses among horses. As a result, farm work has been entirely abandoned in some sections. The Commission has made an appropriation for an extensive stock farm, to be used in the introduction and breeding of draft and dairy animals, and has authorized the use of government funds for the importation of draft animals to be sold on easy terms in the provinces where they are most urgently needed. The success of these efforts to restock the islands is dependent upon the ability of the serum institute to turn out a satisfactory antirinderpestic serum in sufficient quantities.

Some of the agricultural opportunities in the Philippines are pointed out by Dean C. Worcester, secretary of the interior, whose department includes the bureau of agriculture. "But a small part of the soil capable of producing these crops to advantage is at present under cultivation. The methods of extracting sugar now used leave approximately 50 per cent of the sugar in the pressed cane when it is thrown on the dump pile. Hemp is cultivated in a haphazard way, where it is not allowed to grow practically wild, and the fiber is extracted by hand. No systematic and sustained effort has ever been made to improve the quality of Philippine tobacco, and the methods used in curing it are very primitive. If rich returns have been realized from the growing of these commodities in the past upon a comparatively limited scale, the results of extensive cultivation with modern methods and machinery are too evident to require discussion. . . .

"There are very large areas of government lands admirably adapted to the cultivation of cocoanuts. Cocoanut trees come to bearing in from five to seven years, reaching the bearing stage more slowly as the altitude increases. The trees can be grown readily and with comparatively little danger of loss. Under existing conditions the minimum annual profit from a fairly good bearing tree is $1 Mexican, and frequently two or three times this amount is realized. The ground under the trees is now either allowed to grow up with brush or is kept clear by hand. The growth of underbrush injures the soil and leads to the loss of falling nuts, while clearing by hand is quite expensive. The use of mowing machines would result in a great saving in the cost of labor necessary to keep the ground clear and gather the nuts. Other crops, such as Indian corn and alfalfa, can be grown between the rows of cocoanut trees while the latter are maturing, and used to fatten hogs, which always bring a good price in the Philippine market."

There are good opportunities for developing cacao and vanilla growing in numerous regions, there being at present no true cacao plantation in the archipelago and the methods practiced very primitive and wasteful.

"An especially fine coffee is grown in the mountain regions of Benguet and Bontoc and in the province of Lepanto. The bushes yield heavy crops and the unhulled coffee at present sells readily in Manila at $35 Mexican per cavan [3.47 cu. ft.], for consumption in these islands or for shipment to Spain. Coffee bushes come to bearing in Benguet in three years. There is no region in the United States which has a more healthful or delightful climate than is afforded by the Benguet highlands, where a white man can perform heavy field labor without excessive fatigue or injury to his health."

The production of milk and of beef are thought to offer great opportunities for profitable development, provided animal diseases can be kept within bounds.

The primitive and undeveloped condition of agriculture in this region, much of which is naturally so productive, indicates the splendid field which lies before the bureau of agriculture for experimental and demonstration work. The country is essentially an agricultural one, and the greatest opportunities for development lie in that direction. The problem of bringing about this improvement and development, however, is beset with unusual difficulties. The government holds 65 million acres out of the 70 million acres of land in the archipelago. The customs and traditions of the people, the result of six years of warfare, and the depredations of animal diseases, in addition to the primitive methods of agriculture which have been followed, combine to present unusual obstacles in the way of reforms and the establishment of new conditions. This is brought out in other parts of the Commission's report.

It is encouraging to note, therefore, that the letters published in the report show a marked interest and appreciation of the bureau of agriculture, and indicate that there is a considerable element capable of profiting by its work. The efforts of the bureau to get in touch with the more intelligent and progressive persons interested in agriculture have resulted in a mailing list of about 1,000 names; and the distribution of seeds for testing has met with cordial cooperation. The popular publications of the bureau have been well received.

That so encouraging a beginning has been made by the bureau in the short time covered by the report speaks much for the energy and good judgment which have characterized this pioneer undertaking, and augurs well for the future development of the work. A more inviting field, viewed from the opportunity for pioneer as well as more advanced work, could hardly be imagined, and under the liberal policy which evidently prevails toward the bureau of agriculture, it should be a foremost factor in preparing the way for developing the neglected resources of the islands.

VALUES IN SCIENCE.[a]

W. H. JORDAN, D. SC.,
Director New York State Experiment Station.

My theme touches the apologetics of applied science. Whatever may be the attitude of scholars who measure values in knowledge from their large and true proportions, we are often made to feel that in the academic world, as well as in the social, many regard science in the abstract as of noble blood, science in use as plebeian. There is no question, I think, but that certain distinctions of "caste" in the domain of knowledge still persistently cling to some of our institutions of learning, fostered perhaps by that dogmatism among educators, not yet wholly extinct, which is said to have denied at one time the privileges of morning chapel exercises to students of science in one of our foremost American colleges. It would be interesting to know whether the Divine Mind sympathized with the view that a study of His material world constituted a sufficient reason for debarring a human soul from His worship! In some colleges and universities, both in this and other lands, a young man seeking to choose a life work as an investigator or teacher would even now be advised earnestly that a study of, and search for, principles in the abstract establishes a man on a plane higher than he can reach if he devotes himself to knowledge in its applied or utilitarian relations.

The judgments of the class room and laboratory affect the verdicts of the drawing room. Mrs. A., whose husband is announced to have solved the problem of the loss of nitrogen from manure, would be decidedly eclipsed by Mrs. B., who could declare with wifely pride that her husband worked out the constitution of some complex organic product. Possibly there are grades of intellectual and social standing within the limits of applied science itself, so that the more common the object toward the study of which scientific knowledge and research are directed, the less the prestige thereby accruing in certain quarters. In fact, it is probably true that the social standing of a scientific effort is more fully determined by the nature of the utilities it is to serve than by comparisons based upon the terms "pure" and "applied."

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[a] Presidential address delivered at the Washington meeting of the Society for the Promotion of Agricultural Science.

Such distinctions make an impression more or less potent upon the public mind, and, what is more serious, they can hardly fail to exercise a determinative influence upon the conclusions of the student who is casting about for a field of work in which he may let loose his scientific enthusiasms.

Is it true that, viewed in any light whatever, a study of the abstract apart from its relations to concrete phenomena or to considerations of utility offers an opportunity for intellectual achievement and for real usefulness superior to that enjoyed by those who labor in the field of applied science? In attempting to answer this question let us first define terms. Science in general is "knowledge gained by systematic observation, experiment, and reasoning"—it is "knowledge coordinated, arranged, and systematized." This definition includes all knowledge. Pure science is that which treats of laws or general statements apart from particular instances and without reference to any application whatever. Applied science is "science when its laws are employed or exemplified in dealing with concrete phenomena." As particular examples of the former we have the principles of geometry, the laws of heat and light, and the general constitution of the compounds of the fatty series, and the latter is illustrated by applied mechanics, soil physics, our knowledge of nitrogen acquisition and loss in agricultural operations, our understanding of certain fermentations as utilized in technical processes, and the facts of plant and animal diseases. In a very obvious and emphatic sense, science is applied when it is utilized in explaining and directing industrial operations and the practical affairs of life.

It is reasonable to assert, then, that the devotee of pure science seeks knowledge for knowledge's sake, for the love of truth, and that the student of the concrete and the practical must of necessity be inspired more fully by a desire to comprehend the functions of energy and of law and to master their utilities. Our question may be restated in another phraseology: Who stands on the higher plane in the domain of science, the theorist or the utilitarian, the one who uncovers a law or the one who discovers its practical relations and uses?

We are bound to inquire in the first place whether there are inherent differences in the quality and value of knowledge according to its subject-matter. When it appears that science in one department is for any reason more precious than some other class of systematized facts, then we have a good reason for choosing the larger value. But how shall we judge? If we adopt a commercial standard and base our estimates on cost in human effort we shall not find that the men of pure science have acquired all of the highest values. Measured by the expenditure of intellectual energy in securing it, our knowledge of the economics of plant and animal life must be classed among the most precious of the results of modern research. If we measure the worth and dignity of knowledge by its utility in material things, that is, by its importance to industrial life and its relation to man's physical welfare in giving him increased control over his environment, then it is clear that applied science is in this respect the all-important and triumphant factor of the twentieth-century civilization.

But there are those who protest that these utilitarian applications of knowledge are its inferior uses, and that the true test of its higher value is secured when it becomes an instrument for developing intellectual strength and an inspirational force in stimulating men to high thinking and to the acceptance of lofty ideals. To this protest it may be answered that physical well-being and material prosperity are conditions essential to the nourishment of the best fruits of civilization, and that in contributing to industrial achievements and to the comfort and independence of the individual, science is indirectly a powerful aid in cultivating man's intellectual and moral attributes. More than this, I am not convinced that our higher natures are more profoundly moved by the consideration of principles and law in the abstract than by a contemplation of their operations as manifested in the world of matter and force. A study of mathematics and of the principles of physics is a disciplinary intellectual exercise, but the concrete results of their application in the dynamo, the twentieth century express, the ocean liner, and the Brooklyn bridge arouse our pride, fire our imagination, and stimulate our ambition.

The abstractions of chemistry and of biology appeal with little force to man's esthetic and moral nature, but an insight into the operations of law and the play of forces in their relations to man and his activities not only strengthens us intellectually but points us to the wonderful harmonies of created things, exemplifies and exalts obedience to the Divine edicts, and moves to reverent worship. Abstract truths are cold, inanimate, and devoid of human relation. They may delight the intellectual recluse through the mere pleasure that comes from their mastery, but they are not joined to human need and effort. It is the student of the activities that surround us, from the profound problems of the reproduction and maintenance of life to the devices and instrumentalities with which we earn our daily bread, who feels the pulsations of infinite energy and sees most clearly the essential relations of dependence and control which man sustains. The study of specific problems that touch human living, even though they relate to material welfare, discloses human needs, cultivates the altruistic spirit, and, I am convinced, promotes, as pure science can never do, "the inculcation of those supreme ideals through which the human race is uplifted and ennobled—the ideals of beauty, honor, duty, and love." For we should count science as among the humanities, since it emerged from the laboratory and laid its beneficent hand upon man's daily life and avocations.

The pursuit of science involves not only values but opportunity. The opportunity which the right-minded student desires is a field of work where he may make enduring and beneficent additions to the sum of human knowledge. Can he do this if he is chiefly occupied with the solution of problems important to practical life? I venture the prediction that the greatest contributions to science, even to that which we term pure, during the century upon which we have entered, will flow from the labors of those investigators whose main efforts are directed either to the mastery of Nature's energies as a means of industrial advantage, or to the amelioration and improvement of the conditions of human living. Possibly it is already true that more generalizations of an important character are reached as by-products from the study of specific economic problems than from research that has as its primary object the discovery of abstract principles.

You will doubtless recall that at our last meeting Fries presented new facts concerning the composition of atmospheric air, a direct result of Armsby's researches touching the economics of animal nutrition. The New York Agricultural Experiment Station has been engaged for two or three years in the study of problems important to the cheese industry, out of which have come contributions to chemical knowledge as well as facts that are likely to more fully explain the processes of gastric proteid digestion. The history of the progress of science is full of similar instances where researches having in view purely utilitarian ends have added materially to abstract facts and principles. Properly conducted investigation of specific economic questions can not fail to discover related causes or laws that are of general interest, so that the student in the field of applied science has the almost sure hope of a double reward.

Doubtless there are those who regard these by-products of economic studies that come to us in the formulation of abstract truths as of more value than the solution of the practical problems around which these truths cluster. Few of us would consent to this conclusion, I fancy. The assertion that to know is greater than to act, that abstract truth is a larger value than service, is intolerable in this humanitarian age. Such an assertion is equivalent to the statement that a mode of action is superior to the ends it serves. To accept such a creed is to assent to the doctrine that facts and principles are all sufficient ends in themselves, and are more important as isolated entities than as utilities for promoting human progress and welfare.

We can not condemn too severely an estimate of the value of education and research based solely upon the aid they give to money getting; but we should not confuse this degrading point of view with the instinctive purpose of humanity to use all its acquired powers in securing the most complete adaptation possible to its environment. No result could be more unfortunate than the repression of that

Divine impulse of the human mind to fathom the unknown. The love of truth is fundamental to all research that is worthy of the name, but it reaches the fulfillment of its highest function when there is joined with it the altruistic motive. The scientist who uses the great investigational ability with which he is endowed merely for intellectual gratification or solely for the advancement of his professional standing, has missed the higher ideals of labor and of service.

It is not mere sentiment to declare that the day of exclusiveness and aristocracy in learning is passing, and that the day when the scholar shall serve with dignity in common things is here. In fact, there are no longer things common and unclean in whatever touches human welfare.

The results of scientific research that center around a field of corn or a pail of milk, as an aid to the sustenance and comfort of the human family, possess no elements of inferiority. While we may defend our devotion to science in its practical relations we need not apologize for it. The student may prize such knowledge as he would prize fine gold, and may pursue it even to the attainment of lofty ambitions.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The determination of phosphoric acid by means of ammonium phosphomolybdate, G. P. Baxter (*Amer. Chem. Jour., 28 (1902), No. 4, pp. 298–315, fig. 1*).—The author reports a study of the conditions of precipitation in which he found that a precipitate of constant composition, $(NH_4)_3PO_412MoO_3$, can be obtained which contains 3.783 per cent of phosphoric acid. The phosphate solution (without large excess of nitric acid) should contain 0.1 gm. phosphoric acid to 50 cc., and should be poured into at least 50 cc. excess of molybdic solution (150 gm. ammonium-molybdate, 1 liter water, 1 liter nitric acid of 1.2 sp. gr.) with vigorous stirring, the mixture being allowed to stand at room temperature for 16 hours. The precipitate is washed with 10 per cent ammonium nitrate solution and heated in a Gooch crucible at least 2 hours at 300° C. A curve is given from which the phosphoric-acid content for different weights of precipitate may be obtained. Precipitation may be hastened by the addition of ammonium nitrate (10 gm. to 100 cc. of molybdic solution) without appreciably affecting the results.

Determination of phosphoric acid in Wiborgh phosphate, M. Weibull (*Svensk Kem. Tidskr., 14 (1902), p. 135; abs. in Chem. Ztg., 26 (1902), No. 90, Repert., p. 297*).—The citrate method was found to give too high results, due to simultaneous precipitation of silicic acid. This was prevented by adding to the solution before precipitation with magnesia mixture a 20 per cent iron chlorid solution at the rate of 0.1 gm. of iron to 0.5 gm. of substance, and 2 drops of bromin water if the solution smells of hydrogen sulphid.

Methods for the determination of total phosphoric acid and potash in soils, C. B. Williams (*Abs. in Science, n. ser., 17 (1903), No. 418, p. 29*).—The method proposed for phosphoric acid is as follows: After igniting 5 gm. of soil in a platinum dish, treat 3 times with hydrofluoric acid, evaporating to dryness each time. Fuse with 10 gm. of a mixture of equal parts of sodium and potassium carbonate, and after cooling the cake thus obtained transfer it to a beaker and digest with 30 to 40 cc. of (1 to 1) hydrochloric acid. Evaporate the solution to dryness on a water bath, heating subsequently for 4 or 5 hours in an air bath to 110° C. to dehydrate silica. Take up in dilute hydrochloric acid, filter, and wash. Add sufficient nitric acid to the mixed filtrate and washings thus obtained to liberate all hydrochloric acid present and evaporate to a volume of 40 cc. Neutralize the excess of nitric acid with ammonia and add 10 to 12 gm. of ammonium nitrate. After cooling add 30 cc. of recently filtered molybdic solution, completing the precipitation by the use of a Wagner shaking machine, and determine phosphoric acid volumetrically by the author's method.[a]

To determine total potash treat 4 gm. of soil in a platinum dish on a water bath, after saturating with dilute (1 to 1) sulphuric acid and igniting, with from 2 to 3 cc. of hydrofluoric acid, 5 times, adding 1 cc. of dilute (1 to 1) sulphuric acid just before bringing to dryness the last time. After the last traces of hydrofluoric acid have been liberated remove the dish from the water bath and heat gently over a small flame until all evolution of sulphur trioxid ceases. Take up with 20 cc. of distilled water slightly acidified with hydrochloric acid and digest on a water bath until the solution has been reduced to about one-third of its original volume. Then transfer to a 200 cc. graduated flask and heat on a water bath to near the boiling point. Add ammonia and ammonium oxalate in sufficient quantity to precipitate all iron, alumina, and lime present. Cool and make the volume to 200 cc., using an aliquot corresponding to 2 gm. of the original substance for the determination of potash by the Lindo-Gladding method.

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[a] Jour. Amer. Chem. Soc., 23 (1901), p. 8.

On the determination of potash by the modified Finkener method, H. Neubauer (*Landw. Vers. Stat., 57 (1902), No. 5–6, pp. 461–470*).—A defense of the author's modification of Finkener's method (E. S. R., 12, p. 714) against a criticism of it by the fertilizer section of the German Association of Experiment Stations.

The supposed loss of potash in incineration, R. Woy (*Ztschr. Oeffentl. Chem., 8 (1902), pp. 389–394; abs. in Chem. Centbl., 1902, II, No. 24, p. 1429*).—In incinerating wine argols the author found no metallic potassium (as claimed by Barth) in the gaseous products of combustion, although titration of the potassium carbonate formed showed an apparent loss of 20 per cent potash in some form. Gravimetric determination showed no such loss. The apparent loss was due to the formation of sulphate and traces of nitrate of potash by the products of combustion of the gas used in the incineration and their deposition on the upper part of the dish.

The determination of the active constituents of marl and limestone, H. Bode (*Fühling's Landw. Ztg., 51 (1902), Nos. 20, pp. 729–733; 21, pp. 771–780*).—Various methods which have been proposed for the analysis of these substances are discussed. The method found most satisfactory is to heat 1 gm. of the substance with 50 cc. of 10 per cent acetic acid until bubbles of carbon dioxid cease to be given off (usually $\frac{1}{4}$ hour), dilute to 100 cc., and use 25 to 50 cc. of the solution for the determination of lime and magnesia. Tests of the method on a variety of calcareous substances indicate that it furnishes a very accurate means of determining the lime and magnesia combined with carbon dioxid and hence in more available form.

On a new apparatus for the determination of nitrogen, C. Porcher and M. Brisac (*Bul. Soc. Chim. Paris, 3. ser., 27 (1902), No. 22, pp. 1128–1130, fig. 1*).—An apparatus for the determination of nitrogen in ammoniacal salts by decomposition with hypobromid is described.

The analytical methods for carbohydrates as applied to foods and feeding stuffs, W. H. Krug (*Jour. Franklin Inst., 154 (1902), Nos. 5, pp. 349–366; 6, pp. 401–422*).—The author gives general methods for the determination of water-soluble carbohydrates, starch, pentosans, and galactan, and special methods used in the examination of the following food products with reference to the detection of adulteration: Meats and meat products, milk and milk products, flour and breadstuffs, sugars, fruit products, confectionery, beer, malt extracts, wines, distilled liquors, coffee, cocoa, spices, and condiments.

Study of methods of cattle food analysis, C. A. Browne, Jr., and C. P. Beistle (*Pennsylvania Sta. Rpt. 1901, pp. 117–122*).—Determinations of the moisture, starch, pentosan, and galactan contents of 1 sample of wheat, 2 of bran, and 1 of clover seed are reported. The work was done for the Association of Official Agricultural Chemists for the purpose of testing methods, and noted in the report of the referee upon this subject (E. S. R., 13, p. 410).

The Halphen reaction and its value in the examination of butter, B. Sjollema and J. E. Tulleken (*Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 19, pp. 914–916*).—The same coloration was obtained with butter from cows fed cotton-seed meal as with cotton-seed oil.

The Wijs method of determining the iodin value of oils and fats, T. F. Harvey (*Jour. Soc. Chem. Ind., 21 (1902), No. 23, pp. 1437–1439*).—The results of tests of the Wijs method of determining the iodin value of oils and fats are reported. This method is considered as having many advantages over that of Hübl, chief among which is the great stability of the solution used. The procedure is practically the same in the 2 methods. The iodin values of a number of oils determined by the Wijs method are given.

Determination of boric acid in margarin, A. BEYTHIEN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 16, pp. 764–766*).—From 50 to 100 gm. of margarin is well shaken with 50 cc. of hot water and filtered through a dry filter. The filtrate, of which 40 cc. can usually be obtained, is neutralized with deci-normal sodium hydroxid, phenol-phthalein being used as an indicator. After the addition of 25 cc. of glycerol the titration is completed.

Determination of alcohol in very dilute solutions, G. ARGENSON (*Bul. Soc. Chim. Paris, 3. ser., 27–28 (1902), No. 18–19, pp. 1000–1003*).—In the colorimetric method given, the alcohol is converted into aldehyde and a few drops of an aqueous solution of fuchsin decolorized with anhydrous sulphuric acid is added when a violet color appears. An appreciable coloration is obtained in solutions containing originally 1 part of alcohol in 10 million by volume.

Observation on the occurrence and properties of cholin, H. STRUVE (*Ztschr. Analyt. Chem., 41 (1902), No. 9, pp. 544–550*).—This article deals with the occurrence of cholin in grapevine sap and in tartar, and also with the quantitative estimation of cholin.

On the determination of carbon monoxid and carbon dioxid in vitiated air, F. JEAN (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 18, pp. 746–748*).—A simple automatic apparatus for this purpose is described. The apparatus consists essentially of 3 connected flasks, through which the air is drawn. The first is closed with absorbent cotton and filled with sulphuric acid to filter the air and remove dust particles and volatile organic matter; the second contains dilute potash or soda solution (colored with Poirrier Blue, C_4B) to remove carbon dioxid; the third, palladium chlorid or ammoniacal silver nitrate, which is decomposed by carbon monoxid and thus furnishes a measure of the quantity of this gas present. Knowing the quantity of each gas required to cause the characteristic reaction with the solutions used (change of color in the alkaline solution and metallic deposit in case of the palladium or silver solution), and measuring the amount of air which it is necessary to draw through before the reaction is brought about, it is easy to calculate the proportions of carbon monoxid and dioxid present.

Observations on the analysis of atmospheric air, O. REBUFFAT (*Gaz. Chim. Ital., 32 (1902), II, pp. 153–157; abs. in Chem. Centbl., 1902, II, No. 23, p. 1390*).—Methods used in examining the air over fields fertilized with night soil are described.

Miscellaneous analyses, M. E. JAFFA (*California Sta. Rpt. 1899–1901, pt. 2, pp. 235, 236*).—This includes analyses of gluten flour, wheat, Wheatine, fruit-preserving liquid, peat, yadoo fiber, meat meal, blood meal, and fish refuse.

International catalogue of scientific literature. D—Chemistry (*Internat. Cat. Sci. Lit., 2 (1902), pt. 1, pp. 468*).—This catalogue is being prepared by a central bureau in London under the directorship of H. F. Morley and by 29 regional bureaus in different countries. The supreme control of the catalogue is vested in an international convention, to meet in London in 1905, 1910, and every tenth year thereafter. In the interval between successive meetings the administration is vested in an international council consisting of one representative from each regional bureau. The plan adopted provides for author and subject indexes for the different branches of science, which have been arranged in 17 groups. This volume, for which E. Goulding is referee, is an incomplete index of the literature of chemistry during 1901, the publication of the second part of the volume being promised in a few months.

Chemicals and allied products, C. E. MUNROE and T. M. CHATARD (*Twelfth

Census United States, Census Buls. 210, 210a, pp. 306; Census Rpts., Vol. 10 (Manufactures, pt. 4), pp. 523–679, 831–978).—This is a statistical report on the manufacture of chemicals and allied products in the United States, from which it appears that a capital of $238,529,641 was invested in the industry in 1900. The aggregate value of the products was $202,582,396. The products included in this report are classified into 19 groups, as follows: Acids, soda products, potashes, alums, coal-tar products, cyanids, wood distillation, fertilizers, bleaching materials, chemical substances produced by the aid of electricity, dyestuffs, tanning materials, paints, explosives, plastics, essential oils, compressed and liquefied gases, fine chemicals, and general chemicals. The number of establishments reported as engaged exclusively or in part in the manufacture of fertilizers in 1900 was 478, the total product being 3,091,717 tons, valued at $46,011,382, thus showing an increase of over 50 per cent in quantity and 20 per cent in value since the previous census. The industry is distributed as follows: North Atlantic States, 155 establishments producing 685,893 tons; South Atlantic States, 198 establishments producing 1,531,688 tons; North Central States, 63 establishments producing 258,726 tons; South Central States, 39 establishments producing 352,778 tons; Western States, 9 establishments producing 22,131 tons; all other States, 14 establishments producing 35,788 tons. The production of superphosphate is reported as 937,008 tons, ammoniated superphosphate 143,648 tons, and complete fertilizers 1,478,826 tons, valued respectively at $8,592,360, $2,462,888, and $26,318,995. Among other fertilizers, amounting to 532,235 tons, valued at $8,637,139, are included 28,977 tons of fish scrap valued at about $480,000, 160,962 tons of slaughterhouse and meat-packing refuse valued at $3,326,119, and 17,809 tons of garbage reduction material valued at $256,322. Of the 1,352,730 tons of sulphuric acid produced in 1900 by 127 establishments in the United States, 654,966 tons was furnished by 79 fertilizer establishments, which used 583,859 tons of the acid in the manufacture of superphosphates. The valuation of the natural and artificial tanning materials produced was $1,899,220. A digest of patents relating to chemical industries, prepared by S. B. Ladd, is included.

BOTANY.

Chlorophyll assimilation at low atmospheric pressures, J. Friedel (*Rev. Gén. Bot., 14 (1902), Nos. 164, pp. 337–355; 165, pp. 369–390, figs. 5*).—The author has investigated the influence of pressure of rarefied air, and of atmospheres in which the amount of carbon dioxid and oxygen was varied according to definite proportions. It was found that the diminution of pressure does not as a rule influence the nature of chlorophyll assimilation, but in some cases does affect its intensity. The phenomena of assimilation under the conditions of the experiment seem to be the dependent on two forces, the total pressure and the relative pressure of carbon dioxid. The relative pressure of oxygen has no influence on assimilation. Among evergreen shrubs the total atmospheric pressure was without influence, while the influence of the carbon dioxid pressure varied with the age of the leaves. An increase in atmospheric volume favored assimilation if the pressure remained constant. If the volume and pressure were successively varied or if modified simultaneously the result was the same. Assimilation at low pressure was carried on normally by an entire plant of *Lapidium sativum*, and the leaves of the black locust were influenced in the same way as the young leaves of the evergreen shrubs *Ruscus aculeatus*, *Euonymus japonicus*, and *Ligustrum japonicum*.

The injurious effect of smoke and gases on plant growth, E. Haselhoff and G. Lindau (*Die Beschädigung der Vegetation durch Rauch. Leipzig: Borntraeger Bros., 1903, pp. VIII+412, figs. 27*).—The rapid extension and development of various chemical, manufacturing, and other industries the works of which give off large amounts of smoke, gases, etc., have been attended with much injury to trees and other vegetation. These injuries have been extensively studied by the authors and many others, and the information is brought together in what is called a handbook for the recognition of the injury and estimation of damage done by smoke, gases, and similar agents. After a general discussion of the various sources and kinds of injurious smoke and gases, the authors consider a number of them in detail, chapters being devoted to the injury caused by sulphurous and sulphuric acids, chlorin and hydrochloric acid, hydrofluoric, nitric, and acetic acids, ammonia, bromin, coal tar and its products, asphalt, illuminating gas, etc. Means for preventing some of the injuries are discussed, and an extended bibliography of references to the literature of the subject completes the work.

Injurious effects of premature pollination, C. P. HARTLEY (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 22, pp. 48, pls. 4, fig. 1*).—The investigation here reported seems to indicate that decidedly injurious effects may be obtained by premature pollination, showing the necessity of careful consideration as to the time for applying pollen to the stigmas in experiments in plant breeding. The author conducted experiments with tobacco, cotton, orange, and tomato flowers, contrasting the effects of immature and mature pollinations. It was found that flowers which mature their pistils before their stamens were uninjured by premature pollination, while those that mature their anthers and stigmas at the same time were injured. The application of good tobacco pollen to immature tobacco pistils caused the flowers so treated to fall from the plant because of the growth of the pollen tubes into their ovaries. Somewhat similar results were obtained with tomatoes, only 2 out of 40 blossoms setting fruit when prematurely pollinated. Tobacco and tomato plants were found to sometimes set and ripen fruits without the flowers having received any pollen, but such occurrences were rare and the fruits contained no fertile seeds. The experiments described show that while some flowers can be successfully pollinated at the time emasculation of the flower is performed, others can not, and no arbitrary rules of procedure can be given for all flowers.

Mendel's principles of heredity. A defense, W. BATESON (*Cambridge Univ. Press, 1902, pp. 212*).—The author presents a translation of Gregor Mendel's experiments in plant hybridization (E. S. R., 13, p. 744) and answers by argument Weldon's criticisms (E. S. R., 14, p. 446) of Mendel's work. The problems of heredity are stated and their solution discussed. A bibliography of 36 papers on hybridization is appended.

Experimental studies in the physiology of heredity, W. BATESON and Miss E. R. SAUNDERS (*Rpts. to Evolution Com., Roy. Soc.* [*London*], *1902, pp. 160; abs. in Bot. Centbl., 90* (*1902*), *No. 37, p. 291*).—The results of extensive breeding experiments with poultry and plants are given. So far as the results of the experiments with plants are concerned, the phenomena observed in Lychnis, Atropa, and Datura follow Mendel's law with considerable accuracy, and no exceptions were discovered that did not appear to be merely fortuitous. In the case of the experiments with Matthiola the phenomena were much more complex. In some cases the results followed Mendelian principles, while in others they seemed to depart, but could be grouped into fairly definite classes, but their nature was obscure. The paper concludes with a general discussion of heredity as exemplified by Mendel's law.

Variation in Trillium grandiflorum, H. W. BRITCHER (*Maine Sta. Bul. 86, pp. 169–196, pls. 5*).—A record is given of the variations observed in 185 specimens of *Trillium grandiflorum*.

Comparative anatomy of the styles and stigmas of phanerogams, F. GUÉGUEN (*Jour. Bot.* [*Paris*], *16* (*1902*), *Nos. 1, pp. 15–30; 2, pp. 48–65; 4, pp. 138–144; 5, pp. 167–180; 8, pp. 280–286; 9, pp. 300–313, pls. 22*).—Results of an extensive study of the anatomical structure of the styles and stigmas of the phanerogams are given, the notes being arranged according to plant families. As a rule the complexity of the tissues of the styles increases with the greater specialization of the plant. The stigmas and stigmatic surfaces are less constant in their structure, being modified for the various conditions under which they secured pollination. As a rule those families of plants in which cross fertilization is usual have stigmas bearing a marked similarity throughout the group.

The morphology and physiology of the germination of Spermaphytes, A. J. J. Vandevelde (*De kieming der Zaadplanten, morphologie en physiologie. Ghent: J. Vuylsteke, 1900, pt. 2, pp. 137–301, figs. 28*).—Part 1 of this work, which appeared in 1897 (E. S. R., 9, p. 526), was mostly taken up with a bibliography of the subject. In the present contribution the morphology of germination is discussed at considerable length, as is also the physics and physiology. The bibliography quoted in the first part is added to, and reviews are given of the extensive literature relating to this subject.

Studies on tuber formation, N. Bernard (*Rev. Gén. Bot., 14 (1902), Nos. 157, pp. 5–25; 158, pp. 58–71; 159, pp. 101–119; 160, pp. 170–183; 161, pp. 219–235; 162, pp. 269–279, pls. 3*).—The author designates by the term tuberization the special development which is characterized by the slow morphological and histological differentiation of vegetative points of growth or buds, and which serve for the storing up of reserves not utilized by the differentiation. He has examined quite a number of species of orchids, ranunculus, potatoes, and other tuber-forming plants, and finds their roots normally infested with filamentous fungi which are apparently of the genera Nectria, Hypomyces, and others. On account of the constant presence of the fungi the author believes that they are a requisite to the formation of tubers He has divided the different methods of tuber formation into 3 categories: Precocious tuberization, in which the infection of the plant takes place at the time of germination and continues throughout the life of the plant; tuberization which is precocious and periodic, in which there appear to be alternate periods of infection and noninfection; and late periodic tuberization, in which the infection is not realized until a considerable time after germination. This last form is the one observed in the case of the potato, the others being illustrated by various species of orchids.

Electric response in ordinary plants under mechanical stimulus, J. C. Bose (*Jour. Linn. Soc. [London], Bot., 35 (1902), No. 245, pp. 275–304, figs. 25*).—A series of experiments was conducted to determine whether the response phenomena showed a parallelism between animal and vegetable life. It was desired to ascertain the relation between the intensity of stimulus and the corresponding response on the part of the plants, and the effect of various stimuli such as chemicals, temperature, anæsthetics, etc. The experiments were conducted upon the roots, stems, leafstalks, flower stalks, and fruits of a number of plants, and the results obtained indicate that the electric record gives an unfailing indication of the modification of the plants' vitality under the influence of various external agencies. The electric response is shown to be a faithful index of physiological action, and the response was found to be modified by any influence which affected the vitality of the plant.

A method of investigating the gravitational sensitiveness of the root tip, F. Darwin (*Jour. Linn. Soc [London], Bot., 35 (1902), No. 245, pp. 266–274, figs. 9; abs. in Bot. Centbl., 90 (1902), No. 11, p. 295*).—A method is described for investigating the sensitiveness of the root tip of plants to the influence of gravity, which consists of fixing the root tip by means of a tube in a horizontal position so that the cotyledons and hypocotyl are free to move. These organs are so supported by a counterbalance that when geotropic curvature of the root begins, the cotyledons move, in some cases traveling through as much as a 180° arc. The experiments showed that there was a strong tendency in the case of the root of the bean and pea to continue curving when the tip was fixed horizontally and the other end of the seedling was free to move. The results obtained are based on the assumption that the tip is the only part of the root which is sensitive to gravity.

Root pressure in Begonia, J. B. Dandeno (*Science, n. ser., 16 (1902), No. 412, pp. 833–835*).—An account is given of experiments with a vigorous growing begonia plant in which the stem was cut about 3 in. above the surface of the soil in the flower pot, and a glass tube firmly connected with it. Through this tube the sap was forced to a height of 9 ft. 10 in., the total amount of sap passing through the tube being 165 cc. As this phenomenon is usually accounted for by osmotic pressure of the cell sap, the author believes that in this case it could be hardly due to that alone, as the sap in the glass tube was of a too dilute solution. The results obtained are believed to be far in excess of that indicated in van't Hoff's law.

The occurrence of calcium oxalate crystals in seedlings of alsike clover, J. Percival (*Jour. Linn. Soc.* [*London*], *Bot.*, *35* (*1902*), *No. 245*, *pp. 396–402*, *figs. 6*).—An examination was made of the seedlings grown on filter paper moistened with distilled water, and it was found that the crystals of calcium oxalate appear along the vascular bundles in the petioles of the cotyledons and are distributed evenly along their length. With increasing age a few crystals may be noticed along the vascular bundles which run through the cotyledons; and as soon as the primary leaves appear, crystals may be found in them lying near the vascular bundles. In seedlings grown in a very damp atmosphere, the crystals diminish in number proportionately.

On the localization of daphnine in Daphne laureola, W. Russell (*Rev. Gén. Bot.*, *14* (*1902*), *No. 166*, *pp. 420–426*).—The laurel, or laurel spurge (*Daphne laureola*), is a common undershrub of Europe and is reputed as being poisonous as well as having certain medicinal characters. A study has been made of the different parts of the plant to determine the localization of the alkaloid daphnine. This substance was found localized in the epidermis of the older organs of the plant, in the cortex and ligneous rays of the stem and leaves, and in a small quantity in the roots. It is always accompanied by oleaginous deposits, which are quite characteristic of this plant.

Report of the botanist, C. E. Bessey (*Nebraska State Bd. Agr. Rpt. 1901*, *pp. 95–129*, *figs. 16*).—A preliminary account is given of the plants of Nebraska which are reputed to be poisonous or suspected of being so. The plants are arranged according to families, and each species briefly discussed, after which a list is given of the poisonous plants arranged according to their effect.

A catalogue of the grasses of Belgium and their fungus parasites, H. Vanderyst (*Bul. Agr.* [*Brussels*], *18* (*1902*), *No. 6*, *pp. 1044–1059*).—A list of grasses found indigenous and growing under cultivation is given, together with an enumeration of their rust and smut parasites.

Notes on plants received for identification and their economic value, J. B. Davy (*California Sta. Rpt. 1899–1901*, *pt. 2*, *pp. 345–383*).—Notes are given on a large number of plants which have been received from time to time for identification, and suggestions offered relating to their economic value. In addition, lists are given of seeds and plants received at the station, as well as of the exchanges which have been carried on between that and other institutions.

Studies on the reproduction of some of the higher fungi, A. de Gomont de Lesparre (*Étude sur la reproduction sexuelle de quelques champignons supérieurs. Paris: Paul Klinksieck, 1902, pp. XX+61, pls. 3, figs. 16; rev. in Jour. Roy. Micros. Soc.* [*London*], *1902*, *No. 4*, *pp. 472*, *473*).—A historical account is given of the sexual development and growth of truffles, the various speculations regarding the origin and nature of this organism being noted in some detail. The question of the parasitism of truffles is discussed and the author believes that while truffles sometimes live as parasites on the roots of trees they grow equally well as saprophytes in the soil. He has found that the spores germinate on the leaves of trees such as oaks, walnuts, etc., and usually near the central vein of the leaf. They are transmitted to the leaves by insects or by such mechanical agents as the wind. The most favorable time for germination is in December when the leaves are fresh and green, often being still retained upon the tree. The germination and sexuality of the spores are described, and the results of experiments with other Hymenomycetes are given.

A monograph of Amanita and Lepiota, L. Quélet and F. Bataille (*Flore monographique des Amanites et des Lépiotes. Paris: Masson & Co., 1902, pp. 88*).—Analytical keys are given for the species of Amanita and Lepiota, with directions for distinguishing between the edible and poisonous species, and suggestions for treatment in case poisonous species are eaten. The general habits of these mushrooms, their qualities, and preparation for food are described.

A simple respiration apparatus, H. H. Dixon (*Notes Bot. School, Trinity Col., Dublin, 1902, No. 5, pp. 194, 195, fig. 1*).—A form of apparatus is described which consists essentially of 2 globes connected by a U-tube, a cross arm connecting the upper portion of the tube for the transmission of gases. This is adapted to use with various small objects in which the evolution of carbon dioxid is to be shown.

Biological laboratory methods, P. H. Mell (*New York: The Macmillan Co., 1902, pp. XIV+321, figs. 131*).—The author gives full and clear instructions concerning the use of the microscope and other instruments, and methods required in the modern biological laboratory. The present manuals are considered too voluminous for the needs of many institutions and not sufficiently detailed for many students. Chapters are devoted to the microscope and its accessories, and directions given for the preparation of tissues for sectioning and mounting, their staining and preservation. The apparatus for the preparation of photo-micrographs is described and the methods adopted for their preparation are given in considerable detail. The apparatus and methods for use in bacteriological studies are also given, together with numerous formulæ for preparations used in microscopic investigations and suggestions for the arrangement and equipment of laboratories and their furniture.

Sectioning without embedding, H. H. Dixon (*Notes Bot. School, Trinity Col., Dublin, 1902, No. 5, pp. 189–193*).—The author states that if leaves or herbaceous stems be hardened in alcohol for a few days or if woody stems be softened by immersing them in a mixture of glycerin and alcohol they may be readily sectioned with a microtome if securely clamped between 2 flat pieces of cork or pith. In this way he has been able to prepare sections of sufficient thinness to admit of careful histological investigations.

International catalogue of scientific literature. M—Botany (*Internat. Cat. Sci. Lit., 1 (1902), pt. 1, pp. 378*).—This catalogue is an outgrowth of the catalogue of scientific papers hitherto published by the Royal Society of London. The branches of science treated have been divided into 17 groups, each of which is to be catalogued separately. A decimal system of classification has been adopted, and both author and subject indexes are given, about 2,000 publications being listed for the year covered by the catalogue. An examination of this catalogue shows a decided lack of references to American publications, which it is hoped will be corrected in the second part, which is promised.

METEOROLOGY.

Meteorological observations, A. O. Leuschner and J. D. Maddrill (*California Sta. Rpt. 1899–1901, pt. 2, folders opp. p. 388*).—This is a synopsis of observations at Berkeley on atmospheric pressure, temperature, precipitation, relative humidity, cloudiness, and direction of the wind during the 2 years ended June 30, 1901.

Meteorological observations, J. E. Ostrander and S. C. Bacon (*Massachusetts Sta. Met. Buls. 163–168, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during July–December, 1902. The general character of the weather of each month is briefly discussed, and the December bulletin gives a summary for the year. The principal data in this summary are as follows:

Pressure[a] (inches).—Maximum, 30.75, December 15; minimum, 28.86, February 2, February 17; mean, 29.954. *Air temperature*[b] (degrees F.).—Maximum, 91, May 23;

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[a] Reduced to freezing and sea level.

[b] In ground shelter.

minimum, —15, December 10; mean, 47.3; mean sensible (wet bulb), 43.1; maximum daily range, 54, December 10; minimum daily range, 3, November 27; mean daily range, 20.7. *Humidity.*—Mean dewpoint, 37.7; mean relative humidity, 71.6. *Precipitation.*—Total rainfall or melted snow, 46.99 in.; number of days on which 0.01 in. or more rain or melted snow fell, 144; total snowfall, 57 in. *Weather.*—Total cloudiness recorded by sun thermometer, 2,589 hours, or 58 per cent; number of clear days, 73; number of fair days, 113; number of cloudy days, 179. *Bright sunshine.*—Number of hours recorded, 1,864, or 42 per cent. *Wind.*—Prevailing direction, NW.; total movement, 48,438 miles; maximum daily movement, 596 miles, March 19; minimum daily movement, 3 miles, December 7; mean daily movement, 132.7 miles; maximum pressure per square foot, 24 lbs., February 3, NNW.; March 19, ENE. *Dates of frost.*—Last, May 14; first, September 6. *Dates of snow.*—Last, April 2; first, October 29.

Meteorological observations in Nebraska during the year 1901, G. D. Swezey (*Nebraska State Bd. Agr. Rpt. 1901, pp. 201–238*).—The general characteristics of the weather of each month of the year are discussed and detailed data of observations on temperature, precipitation, cloudiness, and direction of the wind at 159 places in Nebraska are given in tables. "The average atmospheric pressure for the State was 30.02 in., which is 0.04 in. below the normal. . . . The mean annual temperature for the State was 50.1°, which is 1.7° above the normal. . . . The average total precipitation over the State for the year was 22.76 in., which is 0.46 in. below the normal. . . . The prevailing direction of the wind was from the northwest." The most remarkable feature of the weather of the year was the almost unbroken record of high temperature during July, "100° being recorded at some place in the State on every day of the month, and several stations reported 100° or over on 20 to 28 of the 31 days of the month."

Meteorology, C. W. Norris (*Pennsylvania Sta. Rpt. 1901, pp. 195–207, 397–435*).—The observations here recorded are of the same character as those reported in previous years (E. S. R., 13, p. 720). Monthly summaries of observations are given in the body of the report and the detailed record in an appendix. The summary for 1900 is as follows:

Summary of meteorological observations, 1900.

	1900.	Growing season (Apr.–Sept.).
Barometer (inches):		
Mean	30.044	
Highest	30.633 (Feb. 27)	
Lowest	29.220 (Feb. 22)	
Temperature (° F.):		
Mean	50.4	65.8.
Highest	96 (July 17)	96 (July 17).
Lowest	—3 (Feb. 25)	22 (Apr. 11).
Mean daily range	18.2	21.7.
Greatest daily range	37 (May 6 27)	37 (May 6, 27).
Least daily range	2 (Dec. 6)	
Mean daily relative humidity (per cent)	79.2	75.4.
Rainfall (inches):		
Total	31.75	13.71.
Greatest monthly	4.1 (Nov.)	
Greatest daily	1.86	1.11 (May 19).
Number of days on which 0.01 in. or more of rain fell	128	58.
Mean percentage of cloudiness	44.8	36.
Number of days on which cloudiness averaged 80 per cent or more.	92	28.
Average hours of sunshine per day		8 h. 5 m.
Maximum velocity of wind per hour (miles)	35 (Dec. 13)	
Last frost in spring		May 10.
First frost in fall		Sept. 19.

Meteorological observations made at the meteorological observatory of the Technical Institute of Verona during 1901, G. Fracastaro (*Atti e Mem. Accad. Agr., Sci., Let., Arti e Com. Verona, 4. ser., 2 (1901–2), pp. 293–341*).—A detailed tabular record of daily observations on atmospheric pressure, temperature, precipitation, humidity, cloudiness, direction and velocity of the wind, and casual phenomena.

Rainfall at the Manurial and Variety Experiment Stations, Barbados, from December, 1900, to April, 1902 (*Rpt. Agr. Work, Imp. Dept. Agr. West Indies, 1900–1902, pp. 4, 121, 122*).—The monthly rainfall at 14 different places in Barbados is reported.

Composition of Barbados rainfall (*Rpt. Agr. Work, Imp. Dept. Agr. West Indies, 1900–1902, p. 2*).—The total amount of rainfall and its content of chlorin and of nitrogen in different forms are reported for each month from December, 1900, to May, 1902, inclusive.

WATER—SOILS.

A laboratory study of the percolation of water through soil, A. V. STUBENRAUCH (*California Sta. Rpt. 1899–1901, pt. 2, pp. 153–172, figs. 7*).—The percolation experiments reported "were conducted in the usual way, i. e., in glass cylinders filled with the soils (air-dried) under investigation, the rate of flow being easily obtained by measuring the progressive wetting of the soil." In these experiments tests were made of the influences on percolation of the diameter of the tubes (5, $2\frac{3}{8}$, $\frac{3}{4}$, and $\frac{7}{16}$ in.); wetting the soil and drying it at 100° C. and allowing to dry normally; repeated wetting and drying; the use of a vent-tube or a cloth bottom to the cylinders; different methods of filling the cylinders; and tamping or keeping the surface loose.

The results show that the rate of flow is not materially affected by the diameter of the cylinders, but it is difficult to secure uniform results with cylinders of small diameters. Drying at 100° C., repeated wetting and drying either at 100° C. or normally, and tamping the surface retarded percolation. As a result of these observations the author recommends cylinders of $1\frac{1}{2}$ in. diameter and 40 in. long. The following arrangement was found satisfatory: "The bottom of the cylinder was sunk to the depth of one-quarter inch into a thick (2 in.) block of wood, by first boring out a hole of the same diameter as the outside of the cylinder. In the bottom of this hole a smaller one corresponding to the inside diameter of the cylinder was bored to a depth of 1 in. This smaller hole thus formed a cavity beneath the cylinder, from which an outlet tube was provided. The cavity in the block was well paraffined and waxed to make it water-tight, and filled with coarse fragments of granite, over which was pasted a perforated disk of filter paper. The cylinder [provided with a cloth bottom] was filled to the proper mark and secured on top so as to allow it to be inverted. The cloth bottom was removed, and the block of wood put in place—also inverted. Then by simply turning the whole arrangement upright, the column of soil rested on the layer of granite fragments, unexposed to light and with a minimum exposure to air.

"The outlet tube led into a weighed flask, provided with a vent-tube drawn to a fine opening to avoid evaporation while allowing the air to escape. The water was maintained automatically at a depth of one-half inch on top of the soil by means of a Mariotte arrangement; thus evaporation was avoided, and entrance of air at the top end of the cylinder permitted as in receiving flasks. . . .

"The old method of filling in the soil piecemeal was discarded as likely to lead to nonuniform conditions in the cylinders. Instead, the entire quantity of soil was weighed out and placed on a sheet of stiff paper a trifle longer than the cylinder. There it was thoroughly mixed and spread out in a long, narrow strip. The paper was rolled up around this strip of soil, forming a cylinder small enough to fit into the glass tube. By pushing the paper roll of soil as far as possible into the cylinder lying horizontally, and then quickly turning the whole into a vertical position, the soil was dropped in the cylinder in one mass. The paper was then carefully and slowly drawn out, the cylinder being tapped gently all the while. In this way the soil was easily and uniformly brought down to the mark, and all the old trouble with the uneven distribution of the soil particles, when poured into the cylinders, was avoided.

"The standard of compactness for each class of soils was obtained by weighing the quantity which could be conveniently settled or compacted into 100 cc. of space by tapping the sides and bottom of the cylinder—not by tamping the soil itself. The weight of the soil thus obtained was adopted as the weight per unit of volume throughout the experiments with that soil."

The results of determinations by this means of the rate of flow through a number of different kinds of soil (black adobe, loam, and sandy soil), the materials dissolved by the percolating waters, and the effect of alkali on percolation are reported in detail in tables and illustrated in diagrams. "The sandy soil, which it was confidently expected would show the fastest rate of flow, was very much the slowest of the three almost from the start, being 62 hours behind the loam and 45 hours behind the black adobe at the 40-in. mark." This is attributed to the fact that the sandy soil had been proportionately more compacted than the others and had a lower percentage of interspace. It was found that a very small difference in the percentage of interspace caused enormous differences in rate of percolation, emphasizing "the extreme liability of laboratory experiments of this kind to variable results, unless a full knowledge and control of all conditions are obtained before comparisons and deductions are made." The amounts of soluble matter removed by the percolating water were large, especially in the first percolates, but data so obtained are not considered a safe basis for estimates of what occurs in nature. The results of the studies of the influence of alkali on percolation were not considered conclusive.

The motions of underground waters, C. S. SLICHTER (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 67, pp. 106, pls. 8, figs. 50*).—A preliminary discussion by the same author of experimental and theoretical considerations relating to the movements of underground water has already been noted (E. S. R., 11, p. 519). "The present paper treats of the simpler and more general topics connected with the movements of water underground, being intended to answer the more elementary questions which arise in a consideration of the subject. Examples are given of the various areas in which water occurs underground, the origin and extent of the waters are discussed, and methods of bringing them to the surface and making them available are touched upon. To determine the rate of movement of the underflow the author made a series of observations along the dry bed of the Arkansas River, western Kansas, by the following means: A double row of 1¼-in. drive wells was sunk across the channel of the river. The upstream wells were then charged with a strong electrolyte, which dissolved and passed downstream with the moving water. Ammonium chlorid was found most satisfactory for this purpose. The passage of the electrolyte toward the lower well was shown by the gradual movement of the needle of an ammeter, and the final arrival at the well was shown by a sudden and strong deflection of the needle.

Not only are the surface zone of flow and the flow through underground channels, sand, gravel, etc., discussed in this paper, but also the deep zones of flow and the flow through rocks of various kinds, as well as common open wells and artesian and deep wells.

Field operations of the Bureau of Soils, 1901 (third report), M. WHITNEY ET AL. (*U. S. Dept. Agr., Field Operations of the Bureau of Soils, 1901, pp. 647, pls. 96, figs. 25, maps 31*).—This report gives a general review of the work of the Bureau during 1901 by the chief of the Bureau, together with the following papers by assistants in charge of field parties: Soil Survey of the Westfield Area, New York, by R. T. A. Burke and H. W. Marean, Soil Survey of Allegan County, Mich., by E. O. Fippin and T. D. Rice; Soil Survey of the Salem Area, New Jersey, by J. A. Bonsteel and F. W. Taylor; Soil Survey of the Lebanon Area, Pennsylvania, by W. G.

Smith and F. Bennett, jr.; Soil Survey of Prince George County, Md., by J. A. Bonsteel et al.; Soil Survey of Harford County, Md., by W. G. Smith and J. O. Martin; Soil Survey of the Bedford Area, Virginia, by C. N. Mooney, F. O. Martin, and T. A. Caine; Soil Survey of the Prince Edward Area, Virginia, by C. N. Mooney and T. A. Caine; Soil Survey of the Statesville Area, North Carolina, by C. W. Dorsey et al.; Soil Survey of Alamance County, N. C., by G. N. Coffey and W. E. Hearn; Soil Survey of the Cary Area, North Carolina, by G. N. Coffey and W. E. Hearn; Soil Survey of Cobb County, Ga., by R. T. A. Burke and H. W. Marean; Soil Survey of the Covington Area, Georgia, by H. W. Marean; Soil Survey of Montgomery County, Tenn., by J. E. Lapham and M. F. Miller; Soil Survey of the Yazoo Area, Mississippi, by J. A. Bonsteel et al.; Soil Survey of the Yakima Area, Washington, by C. A. Jensen and B. A. Olhausen; Soil Survey of the Boise Area, Idaho, by C. A. Jensen and B. A. Olhausen; Soil Survey of the Hanford Area, California, by M. H. Lapham and W. H. Heileman; Soil Survey of the Lower Salinas Valley, California, by M. H. Lapham and W. H. Heileman; Soil Survey of the Ventura Area, California, by J. G. Holmes and L. Mesmer; Soil Survey of the San Gabriel Area, California, by J. G. Holmes and L. Mesmer; Soil Survey Around Imperial, Cal., by T. H. Means and J. G. Holmes; Soil Survey of the Willis Area, Texas, by J. O. Martin; and Soil Survey of the Lake Charles Area, Louisiana, by W. H. Heileman and L. Mesmer.

The report of the chief of the Bureau deals with the organization of the Division of Soils as a Bureau with largely increased appropriations and facilities for work; the progress, cost, and purpose of the soil survey; and results of the survey, including a discussion of the relation of crops to the type soils examined. During the field season of 1901, 6,557,320 acres, or 10,246 square miles in 15 States, were surveyed and mapped on a scale of 1 in. to the mile as against 3,600,314 acres, or about 5,626 square miles, during the seasons of 1899 and 1900 (E. S. R., 13, p. 924). The average cost of the survey in 1901 was $2.04 per square mile. The purpose of the soil survey is stated to be "to provide an accurate basis for the adaptation of soils to crops," and the attempt is made in this report, on the basis of the results of the survey of the 10,157,634 acres examined to date, to trace the relation between the different types of soil to various crops. The following table gives the different classes and types of soils which have been surveyed and a partial statement of their crop adaptations:

The classes and types of soils surveyed and their crop adaptations.

Kind of soil.	Number of types.	Total area.	Proportion of total area.	Productive area.	Crops and systems of farming adapted to the soils.
		Acres.	*Per cent.*	*Per cent.*	
Stony loam	14	385,660	3.80	43	Wheat (30 per cent), dairying (20 per cent), tobacco (14 per cent), peaches (9 per cent).
Gravel	6	209,000	2.10	2	Grapes and probably other fruits.
Gravelly loam	12	285,476	2.80	63	Wheat (47 per cent), corn (39 per cent), tobacco (14 per cent), citrus fruits (7 per cent), grapes (3 per cent).
Dune sand and sand hill.	2	40,450	3.05	....	
Sand	21	1,454,846	14.30	82	Early truck crops (42 per cent), peaches (24 per cent), tobacco (16 per cent), cotton (7 per cent), sugar-beets (5 per cent), grapes (3 per cent), citrus fruits (2 per cent), alfalfa (1 per cent)
Fine sand	3	93,500	.90	100	Peaches (55 per cent), truck crops (27 per cent), sugar beets (18 per cent), alfalfa (18 per cent).
Sandy loam	36	2,118,593	20.90	93	Alfalfa (23 per cent), wheat (20 per cent), tobacco (18 per cent), corn (16 per cent), cotton (16 per cent), peaches (12 per cent), grapes (9 per cent), citrus fruits (8 per cent), dairying (8 per cent), Lima beans (2 per cent), sugar beets (2 per cent), truck crops (1 per cent).

The classes and types of soils surveyed and their crop adaptation.—Continued.

Kind of soil.	Number of types.	Total area.	Proportion of total area.	Productive area.	Crops and systems of farming adapted to the soils.
		Acres.	*Per cent.*	*Per cent.*	
Fine sandy loam	9	549,260	5.40	99	Cotton (52 per cent), alfalfa (29 per cent), early truck crops (19 per cent), rice (10 per cent), tobacco (7 per cent), wheat (5 per cent), grapes (5 per cent), peaches (2 per cent).
Loam	29	1,114,890	11	93	Wheat (74 per cent), corn (41 per cent), tobacco (21 per cent), dairying (16 per cent), alfalfa (15 per cent), apples (6 per cent), rice (5 per cent), peaches (2 per cent), cotton (2 per cent), sugar beets (1 per cent).
Shale loam	4	222,404	2.20	100	Wheat (89 per cent), grapes (8 per cent), corn (1 per cent).
Silt loam	9	756,609	7.40	59	Tobacco (46 per cent), wheat (38 per cent), cotton (16 per cent), alfalfa (7 per cent), barley (4 per cent), sugar beets (3 per cent), Lima beans (1 per cent).
Clay loam	12	506,473	5	69	Wheat (69 per cent), tobacco (56 per cent), corn (4 per cent), rice (7 per cent).
Clay	18	1,558,590	15.30	76	Wheat (44 per cent), cotton (28 per cent), dairying (8 per cent), apples (3 per cent), tobacco (2 per cent), sugar beets (1 per cent), grapes (1 per cent).
Adobe	6	158,088	1.60	......	Wheat (87 per cent), sugar beets (19 per cent), citrus fruits (19 per cent), barley (12 per cent), alfalfa (9 per cent).
Meadow	4	438,758	4.30	......	Portions liable to overflow, but when protected generally adapted to grasses and corn.
Muck and swamp	6	265,037	2.60	13	Peppermint (13 per cent), celery (1 per cent).

"It is interesting to note that peaches are adapted to 9 per cent of the stony loam, 24 per cent of the sand, 55 per cent of the fine sand, 12 per cent of the sandy loam, 2 per cent of the fine sandy loam, and 2 per cent of the loam, and are not reported as an important crop on any of the other classes of soil. Wheat is reported as an important crop on 34 per cent of the stony loam, 47 per cent of the gravelly loam, 20 per cent of the sandy loam, 5 per cent of the fine sandy loam, 74 per cent of the loam, 89 per cent of the shale loam, 38 per cent of the silt loan, 69 per cent of the clay loam, 44 per cent of clay, and 87 per cent of the adobe. This confirms the general impression that peaches are adapted to loose, open soils of a sandy nature, and to some stony loams, while wheat is best adapted to a loam soil and not so well to heavy clay soils. . . .

"It will be noticed that tobacco is reported as an important crop on a wide range of soils. The reason for this may be found in the fact that different classes of tobacco require very different soils. The light, sandy soils are used in Connecticut for the wrapper-leaf tobacco for domestic cigars, and in Virginia and North Carolina for the bright yellow tobacco. Wrapper leaf is also grown with considerable success in the Connecticut Valley on one of the stony loam soils. In Ohio a filler tobacco for domestic cigars is grown successfully on a gravelly loam, and in Tennessee another type of gravelly loam produces an export type of tobacco. So far as the survey has extended, tobacco is not grown on any of the types of fine sand. It is found, however, on the sandy loams, which in Maryland produce a smoking tobacco, in Virginia a manufacturing tobacco, in Connecticut a cigar-wrapper leaf, and in Pennsylvania a cigar filler. One of the types of fine sandy loam produces a cigar wrapper in Connecticut, and a similar type in North Carolina produces a bright yellow tobacco. The types of loam, silt loam, clay loam, and clay also produce a number of types of tobacco, according to the character of the soil and the climatic conditions. . . .

"It is not to be supposed that the crops given above are the only ones grown upon the several soils; still less that they are the only crops adapted to such soils.

"Where corn is given as an important crop it may well be that wheat and cotton can also be produced. The classification of crops is given more to show the relative agricultural strength of the land than as an indication of the actual acreage of each crop. It should be observed also that climate influences in a very marked degree the crop value of lands, and a soil having the same texture may be adapted to cotton in the South, to wheat in the North, and to alfalfa or sugar beets in the far West. It is not to be assumed, either, that the percentages given will be maintained upon the extension of the soil survey into other areas."

Soil analyses, W. Frear and C. P. Beistle (*Pennsylvania Sta. Rpt. 1901, pp. 137–172*).—Analyses of 2 samples of Cuban tobacco soils (surface and subsoil, manured and unmanured) from the vicinity of Havana, and one of a mica schist soil from Delaware County, Pa., are reported and discussed in detail.

The Cuban soils are of a deep red color and were derived from chalk or limestone formations of a recent geologic period. Their specific gravity was somewhat above the normal for clays, and was much less in the manured than in the unmanured soil. The mechanical analyses indicate that they should be classed as sandy loams, although treatment with a deflocculating agent like 4 per cent ammonia resulted in a complete breaking down of the "sandy" aggregate into the finest clay, the sandy or loamy condition being due apparently to the flocculating action of the lime and magnesia present. The results of the chemical analyses are given in the following table:

Chemical composition of Cuban soils (water-free).

Constituents.	San Antonio.				Zorilla.			
	Unmanured.		Manured.		Unmanured.		Manured.	
	Surface.	Subsoil.	Surface.	Subsoil.	Surface.	Subsoil.	Surface.	Subsoil.
	Per ct.	*Per ct*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Material not decomposed by hydrochloric acid	7.420	15.910	7.150	12.260	15.930	13.050	16.760	13.250
Silica soluble in sodium carbonate	27.080	19.820	27.110	21.610	17.450	19.690	16.630	20.270
Material dissolved in 23 per cent hydrochloric acid:								
Potash	.190	.110	.165	.110	.165	.155	.275	.185
Soda	.140	.135	.130	.120	.220	.210	.255	.135
Lime	270	.370	1.390	.620	.350	.370	2.090	.730
Magnesia	190	.140	.290	.140	.210	.130	.300	.140
Manganic oxid	.118	.086	.150	.139	.070	.081	.128	.107
Ferric oxid	16.630	15.750	15.680	15.970	17.150	17.490	15.610	16.680
Alumina	27.860	29.350	27.105	29.960	28.255	29.270	24.695	28.255
Phosphoric acid	.555	.470	.540	.520	.475	.440	.625	.425
Sulphuric acid	.035	.065	.120	.105	.060	.030	.055	.040
Carbonic acid	.555	.315	1.105	.385	.275	.305	1.755	.430
Chlorin	Trace.	Trace.	Trace.	Sl. Tr.	Trace.	None.	Trace.	None.
Loss on ignition (corrected for carbonic acid expelled)	18.912	16.808	19.420	18.530	19 566	18.930	21.515	19.393
	99.955	99.329	100.155	100.369	100.176	100.151	100.713	100.140
Potash soluble in citric acid (1 per cent)	.0098	.0104	.0640	.0076	.0125	.0094	.1035	.0650
Phosphoric acid soluble in citric acid (1 per cent)	.0087	.0065	0286	.0114	.0060	.0055	.0805	.0095
Nitrogen	.2550	1450	.2900	2100	2300	.1650	.3700	.1950
Organic carbon	2.5020	1.3490	3.1090	2.0010	2.8020	2.0910	4 3510	2 4510
Organic matter in soils (organic carbon × 1.724)	4.3130	2.3260	5.3600	3.4500	4 8310	3.6050	7 5000	4.2260

"A general summary of the characteristic qualities of the [virgin] Cuban soils is briefly as follows: These lands are deeper than most American soils devoted to cigar tobacco; they are nearly as porous as the Connecticut sandy soils, but because of their high content of humus and oxids of iron and aluminum, should show a much greater capacity for absorbing atmospheric moisture; they are rich in nitrogen and phosphoric acid and moderately supplied with potash, but because of the large proportion which the iron oxids and alumina bear to the lime, the phosphoric acid must be very little available, and the conditions are made unfavorable for the renewal of the supply of available potash and nitrates as they are exhausted from the soil. With judicious calcareous manuring, followed later by applications of potash and perhaps of a little soluble phosphate, these lands should show great endurance under intelligent cultivation. . . .

"In the manured lands of each estate the quantities of citric-soluble potash and phosphoric acid are both very much greater than in those unmanured. Especially is the higher amount of lime notable, and its presence as carbonate."

The examination of the mica schist soil showed it to be a ferruginous clay containing a fair supply of fertilizing constituents, but apparently in need of active lime.

Some Cuban soils of chemical interest, W. FREAR and C. P. BEISTLE (*Jour. Amer. Chem. Soc., 25 (1903), No. 1, pp. 5-16*).—An abridged account (dealing only with virgin soils) of the studies more fully reported in the preceding article.

First report on a chemical and physical study of the soils of Kent and Surrey, A. D. HALL and F. J. PLYMEN (*Southeastern Agr. Col., Wye, Rpt. to Tech. Ed. Com. of Kent and Surrey, 1902, pp. 69, map 1*).—This is a first report on a systematic survey of the soils of these 2 counties, the object of which is to fix the types of soil, trace their boundaries, and ascertain their normal variations. The soils are classified and mapped according to their geological origin. About 80 samples of soil and subsoil were examined wholly or in part as regards physical characteristics and chemical composition and the results are reported, with descriptions of methods employed and suggestions as to the fertilizer requirements and methods of treatment and cropping of the various type soils.

The methods of chemical analysis used are essentially those noted elsewhere (E. S. R., 13, p. 914). The type soils reported on are those of the London clay, chalk, and gault clay.

Results of investigations of Turkestan soils, P. KOSSOVICH ET AL. (*Rpt. Agr. Chem. Lab. Dept. Agr., vol. 3; rev. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 3 (1902), No, 1, p. 57*).—The report gives the results of a complete analysis of the 10 per cent hydrochloric acid extract of 23 samples, mechanical analyses of 10 samples, and determinations of the principal constituents and an examination of a water extract (alkali salts) of 74 soils and subsoils. Experiments on the soils with wheat, oats, peas, and pines showed that their cultural value depends largely on their alkali content and that of the plants tested the Turkestan wheat was most resistant to alkali while the pine was least resistant.—P. FIREMAN.

Contributions to the knowledge of the soils and the vegetation of Western Siberia, A. GORDYAGIN (*Kazan, 1901; rev. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 3 (1902), No. 1, pp. 87-90*).—The western part of the basin of the Irtish River is divided by the author into the following 5 zones from north to south: (1) The podzol covered with firs and pines, (2) wooded chernozem with birch forests, (3) steppe chernozem, (4) the zone of chestnut soils with little forest growth, and (5) desert steppes with light colored soils, *Atriplex canum* being the typical plant.—P. FIREMAN.

Mechanical and chemical examination of soils, R. H. LOUGHRIDGE (*California Sta. Rpt. 1899-1901, pt. 2, pp. 172-189, figs. 4*).—Mechanical and chemical analyses of 4 samples of soils, with discussions of the soil characteristics of the regions from which the samples were obtained, viz, Potter Valley, Arroyo Grande Valley, and San Gorgonio Pass. There is appended a list of soils received by the station for examination, and of minerals, rocks, etc., sent for identification.

Alkali reclamation at Tulare Substation, C. H. SHINN (*California Sta. Rpt. 1899-1901, pt. 2, pp. 204-214, figs. 7*).—The progress of this work, begun in 1889 (E.

S. R., 10, p. 235), is illustrated in a series of charts which are briefly explained. These show "the gradual amelioration of the worst spots by cultivation and the use of gypsum," also the rise of alkali after several wet seasons or as a result of irrigation on surrounding farms. Gypsum has been used at the rate of about 7.7 tons per acre annually on these soils for 13 years. "In the four years since 1897 the vineyard of 6 acres has received 34,000 lbs. of gypsum, or 17 tons, which is equal to 4¼ tons per year. This is a profitable use of gypsum, as the crops have been large and the vines have been kept healthy, for which an annual expenditure of less than $4 per acre is little to pay."

Alkali and alkali land, R. H. Loughridge (*California Sta. Rpt. 1899–1901, pt. 2, pp. 190–204*).—Analyses of water from sulphur and hot springs of the Elsinore Valley; determinations of alkali at different depths in lands bordering Elsinore Lake, and at Tulare and Southern California substations; and results of examinations with reference to alkali in miscellaneous samples of soil from various localities in the State are reported, with brief discussions of the results.

Irrigation, cultivation, and hardpan, E. W. Hilgard (*California Sta. Rpt. 1899–1901, pt. 2, pp. 149–153*).—A brief discussion of the formation of plowsole or hardpan in humid regions, and in arid regions under irrigation, and its injurious effect on the growth of plants.

Fixation of phosphoric acid in the soil, J. T. Crawley (*Jour. Amer. Chem. Soc., 24 (1902), No. 11, pp. 1114–1119*).—This question was studied on 2 different kinds of soil in boxes 9 in. square and 9 in. deep. The results show "that when the application of the fertilizer [superphosphate] is followed immediately by irrigation (1) more than one-half the phosphoric acid remains in the first inch of soil, more than nine-tenths in 3 in., and practically the whole within 6 in. of the surface; (2) when an interval of 15 hours intervenes between the application and the irrigation, more than nine-tenths of the phosphoric acid is retained by the first inch of soil and practically the whole by the first 3 in."

In further tests of the total capacity of the soil to fix phosphoric acid "800 gm. of red soil and 50 gm. of double superphosphate containing 20.58 gm. water-soluble phosphoric acid were thoroughly mixed together. This mixture was kept moist to promote the chemical action, and samples were withdrawn from time to time to estimate the water-soluble acid." The mixture was made March 26. March 27, 41.6 per cent of phosphoric acid had become fixed; March 29, 57.7 per cent; April 3, 73 per cent; and April 17, 85.65 per cent. Or, taking 3,500 lbs. as the weight of 1 acre of soil to the depth of 1 ft., it was found that this soil absorbed, after 1 day, 35,235 lbs. phosphoric acid per acre to the depth of 1 ft.; after 3 days, 48,872 lbs.; after 8 days, 61,431 lbs.; and after 22 days, 72,545 lbs.

This high absorptive power for phosphoric acid is attributed to the extremely basic character of the Hawaiian soils.

On the fixation of ammonia and potash by Hawaiian soils, J. T. Crawley and R. A. Duncan (*Jour. Amer. Chem. Soc., 25 (1903), No. 1, pp. 47–50*).—In the investigations here reported the same methods were followed as in the studies on fixation of phosphoric acid noted above. When irrigation followed the application of ammonium sulphate one-half of the ammonia was "retained in the first inch, more than four-fifths within the first 2 in., and almost all within 4 in. of soil. . . . The ammonia was held rather firmly, but subsequent irrigations washed it out in decreasing quantities." Under like conditions "seven-tenths of the potash applied [as sulphate] was retained in the first inch, more than four-fifths in 2 in., and almost all within 6 in. of the soil. . . . As in the case of ammonia, the potash was held rather firmly, but irrigations gradually washed it away, 8 irrigations having washed 19 per cent out of 6 in. of soil."

Predominating processes of soil formation, P. Slyezkin (*Khozyaĕne, 1902, pp. 901–908, 921–930; rev. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *3 (1902), No. 4,* *pp. 488–491*).—The author discusses the principles of the genetic classification of soils and the complex nature of the processes of soil formation as dependent upon parent rock, temperature, and moisture. The influence of the parent rock is of a passive character, while that of heat and moisture is active, giving rise to a predominating soil process for each climatic zone. Thus near the poles and in arid deserts the predominating process is one of physical weathering, while in other regions chemical and biological actions assist physical action.

In the tropical zone, with a clearly defined sea climate, i. e., high temperature and humidity throughout the year, the predominating processes are chemical and biological, resulting in the formation of lateritic and allied soils.

In subtropical regions, with lower temperature and humidity, the chemical and biological processes are interrupted during the winter, and the predominating process is the accumulation of neutral humus, resulting in the formation of chernozem or alkali soils, according to the character of the parent rock.

In temperate zones, in which the temperature is still lower while the humidity is considerable, the predominating process is one of leaching, resulting in the formation of soils of the podzol class.

The forest soils the author does not consider as a genetic zone. Their origin depends on the replacement of predominating process (accumulation of neutral humus) by another (podzol formation), owing to the change of the balance of humidity in the soil. Marshy and inundated soils depend on the constant or temporary predominance of moisture.—P. FIREMAN.

Report of the geologist, E. H. BARBOUR (*Nebraska State Bd. Agr. Rpt. 1901, pp. 239–266, figs. 6*).—This contains an article on volcanic ash in Nebraska soils, a directory of the limestone quarries of Nebraska (by C. A. Fisher), and a bibliography of the geology of Nebraska. The origin, distribution, nature, and uses of the volcanic ash found generally throughout not only Nebraska, but western Iowa, South Dakota, Oklahoma, Kansas, Colorado, Wyoming, and Montana, and regions farther west are discussed. At present the material "is used for polishing and scouring kitchen ware, and as a base for scouring soap. . . .

"Its chemical composition, according to analyses by Prof. H. H. Nicholson, of the department of chemistry of the State university, is as follows: Organic matter, 8.75 per cent; silica, 68.91 per cent; lime, 3.44 per cent; sodium oxid, 3.09 per cent; potash, 0.36 per cent; sulphuric acid, 8.88 per cent; iron oxid and alumina, 6.12 per cent; total, 99.55 per cent. Geologically this deposit seems to be confined to the more recent deposits, and has not been found below the oligicene, but does occur in beds of varying thickness and extent from that point up to the latest formations."

The location and size or condition of the limestone quarries of the State are given. "The limestone formations in Nebraska are the Niobrara, Benton, Permian, and Carboniferous. The surface area of these formations comprises about a dozen counties in the southeast corner."

The geological bibliography includes an alphabetical list (by authors) of 315 titles of articles on geography, physiography, stratigraphy, resources, water supply, etc., compiled from every available source. "Paleontological papers dealing mainly with the descriptions have not been included in every case."

Effects of different systems of manuring upon the amount and quality of the humus in the soil, W. FREAR and E. H. HESS (*Pennsylvania Sta. Rpt. 1901, pp. 173–186*).—As supplementary to a previous report (E. S. R., 13, p. 330) the results are given of studies of the humus contents of the soil of a series of plats which have for a long period "received applications of 6 tons per acre every alternate year for the corn and wheat in an ordinary four-course rotation of corn, oats, wheat, and grass." The results show that "nearly 20 years of fertilizing by biennial applications of yard manure, in which about 534 lbs. of nitrogen were contained, has resulted in an increase, relative to land cropped identically but receiving no manure, of 522 lbs. of nitrogen residual in the soil. The relative increase was only about four-fifths as great when lime was applied with the manure. In the case of land receiving complete mineral fertilizers containing, during the period under discussion, 684 lbs. of nitrogen, the relative increase was only about 260 lbs. of nitrogen. . . .

"The experiments of this station show little difference in the proportions between the nitrogen and organic matter on the several manured plats, except that lime has shown a tendency to cause a more rapid loss of the organic matter than of the nitrogen of the manure it accompanies. Where no manure is used, the residual carbon is relatively greater than the residual nitrogen, as compared with the fertilized lands. . . . The use of mineral fertilizers, with and without nitrogen, was attended by an increase of carbon relative to nitrogen; this was more pronounced where yard manure was applied."

The maintenance of soil fertility under the renting system, H. Bode (*Habilschr., Friedrichs-Univ. Halle, 1902, pp. 64*).

Limestones, W. Frear (*Pennsylvania Sta. Rpt. 1901, pp. 187-191*).—Analyses of 42 samples are reported.

Nitrogen-fixing bacteria, J. G. Lipman (*Pop. Sci. Mo., 62 (1902), No. 2, pp. 137-144*).—This is a popular discussion on the source of nitrogen as plant food, nitrification and denitrification in soils, and the fixation of free nitrogen by root tubercles and by soil bacteria independent of leguminous plants. There are, according to the author, about 6 forms of bacteria capable of fixing atmospheric nitrogen known at present, and there is little doubt that others will be found before long.

FERTILIZERS.

Report on experiments with phosphatic fertilizers on winter grain during 1900–1901, O. Reitmair (*Bericht über die mit Winterhalmfrucht im Herbste 1900 eingeleiteten und 1901 zum Abschluss gebrachten Phosphat-Düngungs-Versuche. Vienna: Landwirtschaftlichchemischen Versuchstation, 1902, pp. 100, map 1*).—This is an account of a continuation of previous experiments (E. S. R., 12, p. 839) in which the action of phosphoric acid in general and of different kinds of phosphates are discussed and 74 cooperative field experiments on rye and wheat in different parts of the Austrian Empire, but principally (about one-half) in German Bohemia, are reported. The phosphatic fertilizers were very effective on winter rye, but much less so on winter wheat. Superphosphate was the most effective form of phosphoric acid used, but Thomas slag was but slightly less effective and was more economical. The Algerian and Belgian phosphates were about equally effective, and in cheapness and effectiveness not very inferior to superphosphate and Thomas slag. The proportion of the phosphoric acid applied taken up by the crop was in no case as high as 10 per cent (with superphosphates 8.2 per cent, with Thomas slag and crude phosphates about 7 per cent). An application of 60 kg. per hectare (53.53 lbs. per acre) of phosphoric acid was abundant for rye and probably excessive in case of the more readily available forms, such as superphosphate and Thomas slag.

Do phosphatic and potassic fertilizers exert a direct influence upon cultivated plants? C. Lumia (*Staz. Sper. Agr. Ital., 35 (1902), pp. 525-549; abs. in Chem. Centbl., 1902, II, No. 21, p. 1338*).—The author concludes from his investigations and observations that the mineral constituents of fertilizers exert a direct and favorable action on the micro-organisms of the soil, but have only an indirect effect on plants by furnishing conditions favorable to organisms which supply them with nitrogen compounds.

The returns from top-dressing with potash salts, Bachmann (*Deut. Landw. Presse, 29 (1902), No. 97, pp. 785, 786*).—Experiments with kainit on barley, oats, and fodder beets, and with 40 per cent potash salt on potatoes are reported. The results show that the best results with potash salts as top-dressing were obtained in case of winter grain, because the winter weather conditions were well suited to dissolve and distribute the salts in the soil. Potash salts should not be applied when the plants are moist with rain or dew, since they will adhere to and injure the leaves. The best results were obtained when the salts were applied in dry weather just before a rain.

On the potash fertilizing of barley and the replacement of potash by soda, P. Doll (*Landw. Vers. Stat., 57* (*1902*), *No. 5–6, pp. 471–476*).—Pot experiments with barley are reported in which the effect of the sulphates and chlorids of potassium and sodium singly and combined in various ways were compared, the soil used being a mixture of one-third sandy field soil and two-thirds pure river sand. The chlorids of both potassium and sodium gave better results than the sulphates. This, it is stated, is due in the case of the potassium chlorid to the greater diffusibility, and in case of the sodium chlorid to its greater power of rendering the potash of the soil available. The applications of soda were only slightly less effective than those of potash, the best results being obtained with mixtures of the two. Analyses of the crop show that as a rule the increase in yield was accompanied by an increase in the proportion of potash or soda in the plant.

Report of work of the Ivanov Agricultural Experiment Station of P. I. Kharitonenko, Kharkov, 1901, J. M. Zhukov (*Rev. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *3* (*1902*), *No. 1, pp. 69–76*).—The report of the operations of this station contains an account of experiments with fertilizers—superphosphates, Thomas slag, untreated mineral phosphates, lime sludge from purification of beet juices, and nitrate of soda—on chernozem soils. The effect of the nitrate in increasing the yield was found to depend very largely upon the progress of nitrification in the soil, and this in turn to a large extent upon the meteorological conditions. Thus in 1898 and 1899, when the available nitrogen in the soil was only 0.0018 per cent, the nitrate was beneficial, but in 1900, with an available nitrogen content of 0.003 to 0.004 per cent in the soil, it was not needed. When there was a sufficient quantity of available nitrogen already in the soil the addition of nitrate lowered the quality of beets. The lime sludge proved an effective fertilizer not only because of its lime content but on account of the nitrogen, phosphoric acid, and potash which it contains in considerable amounts. It was shown that superphosphate was beneficial even during drought and that its effect is not exhausted the first year.—P. FIREMAN.

Report on demonstration fertilizer experiments carried out in Lower Austria in 1901, O. Reitmair (*Ztschr. Landw. Versuchsw. Oesterr., 5* (*1902*), *No. 11, pp. 1289–1357, pl. 1*).—The results of cooperative experiments on potatoes and beets are reported in detail and discussed. In these experiments fertilizers were distributed to 495 farmers, of whom 221 or 44.6 per cent returned reports which could be used. The fertilizers, containing 35 kg. of nitrogen in nitrate of soda, 49 kg. of phosphoric acid in Thomas slag or superphosphate, and 28 kg. of potash in 40 per cent potash salt per hectare, gave an average increase in yield of potatoes of 26 per cent and of beets 32 per cent.

On green manuring experiments in Pomerania, Baessler (*Mitt. Deut. Landw. Gesell., 17* (*1902*), *No. 46, pp. 273–278*).—Experiments with leguminous plants—lupines, serradella, etc.—on different kinds of soil extending over a number of years are briefly reported.

Directions for making local fertilizer experiments, K. Hansen (*Vejledning ved Udførelsen af lokale Gødningsforsøg. Copenhagen: O. C. Olsen & Co., 1902, pp. 35*).—Brief directions are given for the use of farmers, with blank forms for keeping records.

The use of plaster in agriculture, L. Grandeau (*Jour. Agr. Prat., n. ser., 4* (*1902*), *No. 52, p. 825*).—Analyses of 5 samples of gypsum are reported and attention is called to the danger of adulteration.

Commercial fertilizers, E. H. Jenkins et al. (*Connecticut State Sta. Rpt. 1902, pt. 1, pp. 104*).—This includes a statement of fertilizer sales in Connecticut in 1902, the text and an abstract of the State laws relating to fertilizers, a list of manufacturers securing licenses under these laws, notes on the sampling and collecting of fertilizers, explanations regarding the analysis and the valuation of fertilizers, a review of the fertilizer market for the year ended October 31, 1902, and tabulated analyses and valuations of 396 samples of fertilizing materials, including nitrate of soda, sulphate of ammonia, dried blood, cotton-seed meal, castor pomace, dissolved boneblack, dissolved rock phosphate, carbonate of potash, sulphate of potash, double sulphate of potash and magnesia, muriate of potash, bone manures, slaughterhouse tankage, dry ground fish, bone and potash, nitrogenous superphosphates and guanos, tobacco stems, vegetable ashes, wood ashes, leached wood ashes, ashes of tobacco stalks, tobacco-stem ashes, cotton-hull ashes, stone lime, lime-kiln ashes, waste lime from gas manufacture, Mexican potash, garbage tankage, sheep manure, land plaster, and mixed fertilizers.

Fertilizer inspection, C. D. Woods and J. M. Bartlett (*Maine Sta. Bul. 85, pp. 153–168*).—This bulletin contains the analyses of samples collected by a representative of the station during 1902. A previous bulletin (E. S. R., 13, p. 1031) gave the results of analyses of samples furnished by the manufacturers. "A comparison of the results of the analyses of the samples collected by the station with the percentages guaranteed by the manufacturers shows that, as a rule, the fertilizers sold in the State are well up to the guarantee," although considerable variation in different samples of the same brands was observed in several cases.

Analyses of commercial fertilizers and manurial substances, C. A. Goessmann (*Massachusetts Sta. Bul. 84, pp. 30*).—Analyses are reported of 253 samples of fertilizers collected in the course of regular fertilizer inspection during 1902, and of 59 samples of fertilizing materials sent to the station for examination, including wood ashes, hemp ashes, waste ashes, tan-bark ashes, brick-yard ashes, burned bone, ground bone, nitrate of soda, dissolved boneblack, muriate of potash, low-grade sulphate of potash, sulphate of ammonia, green celery stalk and leaf, manure, mold, wool waste, sizing paste, lime, fiber waste, horn dust, tankage, complete fertilizers, and soils.

Composition and value of waste materials of the farm, orchard, and vineyard, G. E. Colby (*California Sta. Rpt. 1899–1901, pt. 2, pp. 259–262*).—Analyses are reported of grape pomace, commercial fertilizers, gypsum, citrus-fruit culls, refuse prunes and olives, and other waste materials. Notes are given on the value of the different materials. It is stated that citrus-fruit culls and grape pomace should be composted with fresh unslaked lime or lime refuse from beet-sugar factories in order to correct acidity before applying as a fertilizer. Olive refuse and pomace on account of their fat content act slowly as fertilizers. Materials containing large quantities of common salt can not safely be used on certain crops, notably tobacco.

Use of commercial fertilizers, G. M. Tucker (*Missouri State Bd. Agr. Mo. Bul., 2 (1902), No. 7, pp. 4–6*).—A brief discussion of general principles.

Fraud in phosphatic slags, Maizières (*L'Engrais, 17 (1902), Nos. 47, pp. 1119, 1120; 50, pp. 1191, 1192*).—Attention is called to the use of ground rock phosphate as an adulterant of slag.

The phosphate industry in 1902, C. C. Schnatterbeck (*Tradesman, 48 (1903), No. 10, pp. 83–85*) —In this article, quoted from the *Engineering and Mining Journal*, consolidation of phosphate mining enterprises is stated to have been a leading feature of the year. The total output during the year is reported as 1,580,997 long tons, an increase of about 5 per cent over that of 1901. As regards consumption the phosphate was about equally divided between Germany, Belgium, and England on the one hand and the southern United States on the other. The shipments of phosphates in 1902 were somewhat over 9 per cent greater than in 1901. Of the phosphates mined in 1902 Florida furnished 839,345 long tons, Tennessee 429,902 tons, South Carolina 285,625 tons, North Carolina 25,000 tons, Pennsylvania 875 tons, The occurrence of phosphate deposits in Arkansas, Georgia, Texas, New Mexico, Missouri, and Alabama, and the discovery and exploitation of new deposits in Africa, Australia, New Zealand, Algeria, Tunis, and Christmas, Ocean, Swan, and Marcus islands are noted.

FIELD CROPS.

Report of the North Louisiana Experiment Station for 1901, D. N. Barrow (*Louisiana Stas. Bul. 71, 2. ser., pp. 930-953*).—This report presents the work of the station for 1901, which included rotation and irrigation experiments and variety, fertilizer, and culture tests with different field crops.

Among 36 varieties of corn Virginia White Dent and Gandy gave the most profitable returns. Champion Yellow Dent and Red Driver yielded more grain than Gandy but were less profitable on account of the smaller yield of stover. Six sweet corn varieties were tested and of these Stowell Evergreen and Country Gentleman produced the largest yields of grain and stover. Mexican June corn, planted June 3, yielded 20 bu. per acre of very good corn. The cost of cutting and shredding stover is estimated at $1.50 per ton. The composition of corn stover, timothy hay, and Johnson grass is given.

In the variety tests with wheat Fultz led with a yield of 28 bu. per acre, followed by Red May with 27 bu. and Harvest King with 26.2 bu. All varieties were harvested the last week of May. Wheat is considered the best winter grazing crop for that region.

Of 20 varieties of cotton under test Hagerman produced the highest yield of seed cotton, 1,680 lbs. per acre. This variety was followed by Boyd Prolific and Peerless with a yield of 1,575 lbs. each. Peterkin Improved gave 31.5 per cent of lint, which was the highest percentage produced. Fertilizer tests with cotton were inconclusive.

The results in rotation and irrigation tests were largely in favor of the plats under rotation and irrigation. The quantity of water in inches required to mature the different crops in 1901 was as follows: Sugar cane 29.40, cotton 18.70, cowpeas 18.70, corn 18.16, sorghum 15.63, tobacco 11.87, and watermelons 11.06. The analyses of sugar cane showed that irrigation not only increased the tonnage but the sugar content as well.

The following leguminous crops were tested: Cowpeas, velvet beans, peanuts, clover, and alfalfa. Yields of 3,234 lbs. of crimson and 3,732 lbs. of red clover hay were obtained per acre. Alfalfa yielded a total of 2.2 tons per acre. Spanish peanuts yielding 4,410 lbs. of hay with the nuts attached were more profitable than Virginia peanuts.

Three varieties of pumpkins, Large Cheese, Kentucky Field, and Cashaw or Crook Neck, yielded 7,168, 6,865 and 4,280 lbs. per acre, respectively.

Notes are given on the culture of rescue grass, redtop, rape, and tobacco. The work of the station with swine, sheep, and poultry is briefly described.

Fixation of atmospheric nitrogen by alfalfa on ordinary prairie soil under various treatments, C. G. Hopkins (*Jour. Amer. Chem. Soc., 24* (*1902*), *No. 12, pp. 1155-1170, pls. 2*).—More fully reported in Bulletin 76 of the Illinois Station (E. S. R., 14, p. 563).

Experiments with barley, Remy (*Deut. Landw. Presse, 29* (*1902*), *Nos. 87, p. 706, fig. 1; 88, pp. 715, 716*).—Breeding experiments were conducted to originate plants adapted to dry localities, and the results obtained and the conclusions drawn are here presented. The measurements and weights of the different parts of the plant for each season from 1900 to 1902, inclusive, are given in tables. Two strains of Hanna and Goldthorpe barley differing in moisture requirements have been obtained and have been grown in comparison. In each case the plants with the low moisture requirements produced the larger percentage of grain. The strains requiring but little moisture were shorter in the straw and also shorter and closer in the head than those which required the greater quantity of water. The quality for brewing purposes in the new strains was not changed because the protein content of the grain and the percentage of glumes to the grain did not enter into the basis upon which the improvement by breeding was carried on. The author discusses the means other than plant breeding by which plants may be successfully grown in dry localities and further points out how by breeding the period during which the plant uses the greatest amount of moisture can be moved toward the winter season and thus the supply of winter moisture be made to benefit the growing plant.

The fertilizer experiments conducted for several years have shown that an increase in yield due to applications of phosphoric acid is accompanied, as in the case of potash, by a proportional decrease in protein content. On the other hand, phosphoric acid did not affect the size of the grain which is so characteristic of potash. The use of phosphoric acid further caused a uniform and rapid development of the young plants. Owing to the rather rapid growth of the plant readily soluble phosphates are required.

Berseem, D. G. FAIRCHILD (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 23, pp. 20; pls. 14*).—This bulletin gives a historical account of the culture in Egypt of berseem (*Trifolium alexandrinum*), also called Alexandrian and Egyptian clover, and describes its general uses. Three distinct varieties grown in Egypt are discussed. *Muscowi* berseem, the variety commonly grown under irrigation in the delta, is the most important. It is stated that this variety planted in early autumn will give 4 cuttings, the first 2 yielding about 8 tons per acre of green forage each, and the last 2 about 6 tons each. When seed is required the plants are allowed to go to seed in June after the fourth cutting. The yield of seed is reported as much heavier than that of clover. An instance is mentioned where berseem planted January 5 was cut March 11, April 7, and April 30, and the roots then plowed under. In an experiment carried on in Algeria berseem sown July 26 yielded a total of 42 tons of green fodder per acre in 3 cuttings, the first one being made September 12. The usual Egyptian yield for 4 cuttings is about 28 tons. In connection with this discussion the records of temperature and relative humidity for June, July, and October of an average Egyptian season, and a comparison of chemical analyses of green berseem and alfalfa in Egypt, are shown in tables.

"Fachl berseem is a variety used in Egypt on land which is irrigated by the basin system—i. e., overflowed for 40 days in the autumn months from August until November, depending on the latitude and Nile overflow. Saida is the name of a variety of berseem which, although yielding less than Muscowi, is relatively more nutritious. It possesses a comparatively long tap root which enables it to thrive with much less water than is required for Muscowi, and it is, in fact, considered a kind of dry land berseem. It is sown in the basins but requires subsequent irrigation, as it yields 2 cuttings."

The value of berseem as a green fodder and hay crop and its probable adaptability to certain sections in this country are considered.

Experiments with white clover, P. P. DEHÉRAIN and E. DEMOUSSY (*Ann. Agron., 28 (1902), No. 10, pp. 497–522, figs. 3*).—Inoculation, fertilizer, and rotation experiments carried on for several years are reported. The inoculation tests were made in pots with 4 soils from as many different localities. On only one soil did the inoculation with garden soil, containing the proper bacteria for clover, show effect. This soil, a sort of leaf mold, contained the necessary bacteria but they were present in insufficient numbers to be effective. The results also showed that lime on noncalcareous soil is of value in this connection when applied together with superphosphate or a soluble phosphate. Lime alone, or applied with a phosphate in nodular form, proved detrimental. Phosphates in nodular form were only slightly effective and inferior in this respect to Thomas slag. On one of the soils potash salts proved beneficial to the growth of the clover. As has been often observed, clover after clover or alfalfa did not make a very good growth.

Varieties of white clover, C. Fruwirth (*Fühling's Landw. Ztg., 51 (1902), No. 24, pp. 877-882*).—The results of tests with Italian, Colossal Ladino, Solemacher, and common German white clover carried on for several years are reported. The yields are given, together with measurements of the leaf and stem of the different varieties. The seed of the common German variety was larger and heavier than the seed of any of the other varieties. As compared with the common German the other varieties made a more luxuriant growth, blossomed later and less profusely, and produced larger quantities of green and air-dry substance and also of dry matter and protein. These 3 varieties grew satisfactorily on sand and clay soils and were equally hardy with the common German. The author found no perceptible difference between these varieties, and regards all as belonging to the same form.

Manual of corn judging, A. D. Shamel (*Urbana, Ill.: Author, 1902, pp. 36, figs. 12*).—The purpose of this manual is to assist and guide in the more systematic study of the ear of corn. Among other points attention is given to standards of perfection, variety measurements, the score card and its use, the study of characteristics, and the handling and testing of seed corn.

Analyses of hop cones and hop vines, G. E. Colby (*California Sta. Rpt. 1899-1901, pt. 2, pp. 252-254*).—Analyses of the ashes of hop cones, the ingredients of hop ashes, the soil ingredients extracted by hop cones and hop vines, and analyses of the soils of hop fields are tabulated.

Experiments with yellow lupines, P. P. Dehérain and E. Demoussy (*Ann. Agron., 28 (1902) No. 9, pp. 449-482, figs. 2*).—Observations on the growth and culture of yellow lupines during 6 years are reported. When grown in sand destitute of humus, yellow lupines, although given commercial fertilizers and lime, either made no growth or grew very poorly. Humus added to the soil under these conditions enabled the plants to grow and flower and even to ripen their seed without the presence of nodules on their roots. These plants grew without utilizing the nitrogen of the air, but using the combined nitrogen in the soil just as is done by nonleguminous plants. Inoculating the roots with extracts from the nodules of alfalfa, hairy vetch, and furze showed no effect. The lupines grew and produced nodules in leaf mold which had received commercial fertilizers, but a better growth was obtained in soil consisting of sand with an addition of 10 per cent of leaf mold. An addition of lime to the leaf mold caused a rapid destruction of the plants, and even in a good friable, calcareous soil, although well supplied with barnyard manure, the plants did not live. In a test with a noncalcareous soil the lupines grew fairly well when commercial fertilizers were used, and in this case the phosphates gave particularly good results, phosphate of potash and Thomas slag being the most effective. In this soil the roots were found well covered with nodules. In another test with a strong soil low in calcareous matter and obtained from a different locality, the upper portions of the roots were very densely covered with nodules. From these results the conclusion is drawn that the activity of the bacteria causing the nodules differs with the soil. At Grignon yellow lupines on a good but rather light soil containing 4 per cent of lime made a fair growth and ripened their seed, but no nodules were produced on the roots. Inoculating soil at Grignon with soils in which the plants were provided with nodules did not give very good results.

Variety tests of oats and potatoes, G. C. Watson and E. H. Hess (*Pennsylvania Sta. Rpt. 1901, pp. 223-234*).—The results of tests with oats and potatoes by the station are summarized and the methods of carrying on the work are described.

Oats.—Of 19 varieties tested in 1900 the most productive were Sensation, Irish Victor, Silver Mine, Henderson Clydesdale, and Heavy Weight Champion, yielding

45.69, 44.94, 42.65, 42.56, and 42.53 bu. per acre, respectively. The average yield of all varieties was 38.52 bu. of grain and 2,305 lbs. of straw per acre. Tables are given showing the average yield of varieties for 9, 4, 3, and 2 years. Among the varieties tested for 9 years Japan gave a slightly better yield of grain than the other varieties and as large a yield of straw. The average weight of grain per bushel for this variety was 36 lbs., but the results show that the weight of the grain per bushel and the yield had little or no connection.

Potatoes.—A test of 95 varieties was made in 1900. The yields obtained ranged from 48.23 to 188.68 bu. per acre and the time of ripening from August 18 to October 12. Heath Late Beauty was the most productive, and Polaris, Six Weeks, Early Andes, and New Bovee Seedling the earliest. Tables are given showing the average yield of the varieties tested 6, 5, 4, 3, and 2 years. Of the varieties tested 6 years Carman No. 1 gave the largest total and merchantable yield. The average yields of the most productive varieties of those tested 6 years were over 16 per cent greater and of the varieties tested 5 years over 45 per cent greater than the yields of the sorts producing the smallest quantities of merchantable tubers.

Saltbushes in the Southern Coast Range, C. H. SHINN (*California Sta. Rpt. 1899–1901, pt. 2, pp. 334–345, figs. 4*).—The work with saltbushes by the station is reviewed and recent results with new species are reported. The value of *Atriplex semibaccata* is pointed out in the results obtained by the station and by farmers in the State. A number of species tested at the Paso Robles substation have given good results, and in this connection special attention is called to the following: *Atriplex nummularia*, *A. pamparum*, *A. cachiyuyum*, *Rhagodia nutans*, and *R. spinescens inermis*. *Atriplex leptocarpa* had no advantages over *A. semibaccata* in that region, and *A. vesicaria* and *A. halimoides* exhibited a tendency to die out in spots when the plants are old. *A. nummularia*, grown from cuttings and without irrigation, gave a yield of 17 tons 485 lbs. of green forage per acre from one cutting. *A. pamparum* and *A. cachiyuyum*.yielded over 15 and 12 tons of green forage per acre, respectively. These 3 saltbushes are large-growing species and produce 2 cuttings a year in that locality. Brief descriptive and cultural notes are given on *R. spinescens inermis*, *R. nutans*, *R. billardieri*, *R. parabolica*, *R. hastata*, *Chenopodium nitrariacea*, and *C. atriplicium*. Directions for the propagation of saltbushes from cuttings and other suggestions as to their culture are also given.

Analyses of sugar beets, M. E. JAFFA (*California Sta. Rpt. 1899–1901, pt. 2, pp. 237–241*).—Analyses of samples of sugar beets from 1898 to 1900 are given in tables and the results are briefly discussed.

The beet-sugar industry in Victoria, A. N. PEARSON (*Melbourne: Robt. S. Brain, Govt. Printer, 1901, pp. 37, pls. 5, fig. 1, dgm. 1*).—This is a paper on the subject published in 1901. The results of experiments with sugar beets in Victoria, including culture, variety, and fertilizer tests, are brought together and the possibilities of the industry are discussed.

Note on the localization of phosphates in the sugar cane, C. H. G. SPRANKLING (*Jour. Chem. Soc. [London], 81 (1902), No. 481, I, pp. 1543–1546*).—Determinations of phosphoric acid and silica in the leaves and in different sections of the stalk of sugar cane are reported. These show that the largest percentage of phosphoric acid was in the leaves, the smallest in the middle sections of the stalk, increasing toward the roots. There appears to be a storage of phosphoric acid as well as silica in the leaves.

Seedling and other canes in the Leeward Islands, 1901–2 (*Imp. Dept. Agr. West Indies, Pamphlet No. 20, 1902, pp. 30*).—This report summarizes the results of experiments with sugar cane carried on at Antigua and St. Kitts-Nevis in 1901–2.

Seedling and other canes at Barbados, 1902 (*Imp. Dept. Agr. West Indies, Pamphlet No. 19, 1902, pp. 67*).—This report summarizes the results of cooperative experiments with selected seedling and other canes. As in previous years, the canes were cultivated on different estates and on black and red soils. A list of the different varieties, with their more general field characteristics and the more important cultural and chemical results, are given. Barbados Seedling 208 gave the best results, being followed by White Transparent. Barbados Seedling 147 and Sealy Seedling were low in quality of juice.

Report of the agricultural work for 1900–1902, J. P. d'Albuquerque and J. R. Bovell (*Rpt. Agr. Work, Imp. Dept. Agr. West Indies, Rpt. 1900–1902, pp. 185*).—The results of fertilizer experiments and variety tests with sugar cane are tabulated in detail, and briefly discussed for each experiment and locality. In addition, the mechanical and chemical analyses of the soil and the rainfall for the different localities in which the work was carried on are given. Experiments with seedling and other varieties of cane are reported, together with descriptions of their general characteristics, yield, and composition.

The origin of starch in the wheat grain, P. P. Dehérain and C. Dupont (*Ann. Agron., 28 (1902), No. 10, pp. 522–527*).—This article discusses the formation of nitrogenous substance in the wheat plant and reports the results of experiments conducted to throw further light upon the formation and accumulation of starch in the grain. The authors point out how the nitrogenous substance in the plant rises from the lower to the upper leaves and finally finds its way into the grain, while during the entire vegetative period no starch gathers in the leaves of wheat as is done in the leaves of the potato, tobacco, the vine, and other plants, and still starch accumulates rapidly in the grains shortly before ripening. It is held that since wheat has no reserves of carbohydrates the starch of the grain must be elaborated from new material, but that the difficulty which presents itself in this connection is the small percentage of green leaf surface, which at this stage is practically confined to the glumes and the upper parts of the stems. An investigation to determine whether these organs at that time are capable of using the carbonic acid of the air and forming carbohydrates showed the incapability of the glumes in this respect.

In order to determine the action of the upper portion of the stems, the heads were removed from a number of plants which were then harvested the next day together with an equal number of entire plants. In both cases the stems only were analyzed and the results showed that the quantity of carbohydrates elaborated in the stems without heads was equal to 5.94 per cent of the dry matter, while in the stems on which the heads were allowed to remain only 1.63 per cent was found. This difference is explained as due to the movement of the carbohydrate substance into the grains, and the results are considered as indicating conclusively that the upper portion of the stem, provided it is still green, performs the function of the leaves in other plants and thus elaborates the starch for the wheat grain. Attention is called to certain seasons in which the conditions of the weather and the resulting yield and composition of the grain go to confirm the above conclusion. The harvest of 1888 at Grignon was late and the process of ripening slow, which resulted in a heavy yield with an average gluten content in the grain of 12.60 per cent and a starch content of 77.2 per cent, while the following season, when the summer was hot and the process of ripening rapid, the grain contained 15.3 per cent of gluten and only 61.9 per cent of starch.

HORTICULTURE.

Specific variation in the graft or asexual hybridization, L. Daniel (*Troisième Congrès International de Défense contre la Grêle et de l'Hybridation de la Vigne. Lyons: Soc. Rég. Vit., 1902, II, pp. 262–365*).—Ancient and modern ideas regarding the existence of variation in grafts are reviewed at length, the author's methods of grafting and carrying on control work discussed, and detailed accounts given of specific variations obtained in scion and stock in grafting a large number of different kinds of plants involving many different families. Illustrations of the results obtained are given in some instances. A bibliography of the works of 67 authors on various phases of grafting is appended.

Formerly it was believed that grafted scions lost none of their own characteristics and acquired no new ones from the stocks on which they were grafted. Recent experiments indicate that these views must be modified. The author notes that a student of his grafted by approach La France, a very double rose, with Panachée d'Orleans a semidouble rose. As a result, the roses grown on the grafted branch of La France were semidouble, while on all the other branches of La France only the very double roses appeared. The author grafted a large red tomato on an eggplant having long violet fruits. The resulting tomatoes changed their shape entirely and took on an elongated form like that of the eggplant fruit. The converse graft produced 3 kinds of fruit—long, smooth, and slightly pyriform like the normal; smooth, ovoid fruits, and fruits slightly flattened like the tomatoes The Bergamotte Espéren variety of pears, which has a rounded form, became more elongated after grafting on the Curé, a variety having a fusiform shape. Entirely new varieties produced by grafting are also noted. The Sylphide rose budded on Homère produced stems with less thorns than either parent, leaves intermediate in size between the two, and blooms intermediate in size and color. Like results with other varieties of roses are also noted. The flavor of Belgian Kidney beans was considerably modified by grafting on another vigorous growing variety (Haricot de Soissons). A number of variations in stem, pith, etc., occurred when *Helianthus latiflorus* was grafted on Jerusalem artichoke (*H. tuberosus*) and common sunflower (*H. annuus*). Hedge mustard (*Alliaria officinalis*) when grafted on cabbage lost much of its characteristic odor. Cabbage having an elongated conical head when grafted on a variety having a flattened round head in some instances took the form of the latter. When privet (*Ligustrum ovalifolium*), with persistent leaves, was grafted on the lilac it regularly thereafter shed its leaves in the fall like the lilac. The foxy taste of certain American grapes has been eliminated by grafting on vines not showing this characteristic.

The author shows that hybrids produced by grafting can be fixed and propagated true to kind. Thus the variety of potato Edouard Lefort, produced by grafting together Marjolin and Imperator, and partaking of the character of each, reproduces itself true to kind. A hardy and improved variety of forage cabbage was secured by grafting a rather tender sort of kohl-rabi on a very hardy form of head cabbage. The hybrid form produced was more hardy, more resistant to disease, and a better forage plant than either parent, and had a form somewhat intermediate between the two. These characters were transmitted through the seed and became permanent thereafter from seed. Variations in tomatoes obtained by grafting have been more or less completely preserved in the seed.

Other interesting results, showing the variations obtained in grafting wild and cultivated carrots, various beans, peppers, eggplants, etc., are also recorded.

From the experiments and observations cited the author draws the conclusion that asexual hybridization is neither constant, nor regular, nor very frequent. In its results it is somewhat similar to cross pollination, but has a wider application, and the resulting forms obtained are less constant in character. Grafting is not always a certain means of perpetuating variations, although it generally is. Grafting itself may occasion variation which in turn can be fixed by grafting.

In order to produce a given variation by grafting or to add to a plant a character which it lacks, it is necessary to graft it on another plant which is superior to it in the quality sought. Thus in the case of the forage cabbage mentioned above, hardiness was obtained in a variety of kohl-rabi by grafting it on one of the hardiest forms of head cabbage. In grafting hybrid vines to secure a desired character, it is necessary to graft together 2 vines having common blood in such proportions that the sum of the blood of the characters desired shall be greater than the blood of any other strain in the graft. Thus, if with a sexual hybrid possessing $\frac{3}{8}$ blood A, $\frac{1}{2}$ blood B, and $\frac{1}{8}$ blood C, a character K of the A blood, which is in the minority, is desired, it is likely to be obtained by grafting it on another sexual hybrid having, for example, $\frac{1}{2}$ blood A, $\frac{1}{8}$ blood B, and $\frac{3}{8}$ blood C. The total blood then which will unite to form the new hybrid will be made up of the sum of these or $\frac{7}{8}$ A blood, $\frac{5}{8}$ B blood, and $\frac{1}{2}$ C blood, in which it is seen that the A blood predominates and the character K is likely to appear. Modifications in vines as regards eradication of the foxy flavor, increase in size of berry, resistance to exterior agents, etc., can thus be obtained.

The author states that the problem of the grape industry in France is to unite the resistance of American roots to the quality of French grapes. This will probably be done not by sexual hybridization alone but by sexual hybridization combined rationally with asexual hybridization by the graft and the preservation of the variation thus obtained by budding.

Curious results obtained in grafting, L. Daniel (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 12, pp. 481, 482; abs. in Rev. Hort.* [*Paris*], *74 (1902), No. 20, pp. 470, 471*).—An account is given of some recent work in grafting *Scopolia carniolica* on tomatoes. *S. carniolica* is a perennial herbaceous plant, and one of the first to appear in spring. After fructification its aerial stems remain green for a short time, then gradually wither, and finally entirely dry up during the month of May. Scions of *S. carniolica* were taken after fruiting, and when the stems had begun to wither, and grafted on growing tomatoes. The graft succeeded, producing new buds and leaves, and one branch gave 3 normal flowers. The success of this graft led to the conclusion that similarity of habit of stock and scion is not an absolute condition of success in grafting.

Specific variations in the graft, G. T. Grignan (*Rev. Hort.* [*Paris*], *74 (1902), No. 17, pp. 414–416*).—This is an abstract of L. Daniel's work noted above.

Specific variations caused by grafting (*Gard. Chron., 3. ser., 32 (1902), No. 832, pp. 409, 410*).—Review of the work of Daniel and Lindemuth along this line.

Electroculture. Increase in the yield of cultivated crops obtained by electrical treatment, S. Lemström (*Elektrokultur. Erhöhung der Ernte-Erträge aller Kultur-Pflanzen durch elektrische Behandlung. Berlin: R. Friedländer & Son, 1902, pp. IV+ 43, figs. 4*).—An abstract of a part of this work has been previously made from current periodicals (E. S. R., 14, p. 352). The pamphlet contains much detailed data in addition to that already noted, including a general description of the electrical machine used. In laboratory experiments it was found that if a capillary tube is placed in a vessel of water which is in electrical connection with the earth, and a fine metal point connected with the negative pole of an electrical machine be suspended over the upper end of the tube, small drops of water soon collect in the upper part of the tube after the machine has been set in motion. This result is believed to throw light on the increased growth of plants subject to electrical currents. Thus when a metal net connected with the negative pole of an electrical machine is suspended above growing plants a more energetic rise of sap containing plant food takes place in the plant and growth is therefore more rapid.

The author's experiments on the whole, with both field and garden crops, show an average increase in growth of 45 per cent due to the use of electric currents. The electrical treatment was most influential in well-tilled fields. On poor soils no noteworthy results were attained. Some plants must be well watered in order to obtain the maximum effect of the electricity. Peas, carrots, and cabbage belong to this class. Electro-culture combined with strong sunlight proved harmful for most plants. It is therefore considered advisable that during the hot, sunny portions of the day the electrical current be stopped.

Growing vegetables under cloth (*Amer. Agr., 70 (1902), No. 22, pp. 595, 596*).—The success obtained in the culture of tobacco under shade in Connecticut and Florida has led various experimenters to try the growing of vegetables under like conditions. The results obtained by some of the growers have been brought together in the present article. F. Bunce, of Hartford, Conn., reports that cucumbers, watermelons, and muskmelons grown under shade were not a success. The vines grew well, but the fruits were small. In the case of cucumbers a few reached small pickling size. The melons did not do as well. He states that strawberries, however, on Long Island were 2 weeks earlier under cloth than out of doors, while wild dandelion just inside the tent made an enormous growth.

C. F. Dane, of Hartford, Conn., a tobacco grower, reports that cucumber, watermelon, and tomato vines grew better in the tent than outside, but yielded hardly any fruit, and the little that set shriveled up.

L. W. Ripley, of the same place, grew muskmelons and cucumbers under cloth, but found no advantage in the practice over outdoor culture. The tent shelter did not protect the vines from mildew or blight. Little difference was found by Mr. Ripley in the temperature inside and outside the tent. The general opinion of the experimenters appears to be that nothing is gained in vegetable culture by growing the plants under cloth.

Sewage and night soil or stable manure and commercial fertilizers for vegetables, J. P. Wagner (*Deut. Landw. Presse, 29 (1902), Nos. 64, pp. 529, 530; 65, pp. 537–539, figs. 4*).—A presentation of some of the objections to the use of sewage and night soil in the culture of vegetables and fruits eaten raw, like lettuce, water cress, radishes, strawberries, etc., with summaries of a number of experiments showing the value of stable manure when supplemented with commercial fertilizers for these crops. The author states that not only is there a natural aversion to the use of such materials as night soil and sewage for growing vegetables to be consumed raw, but, on the authority of Würtz and Bourges, their use is positively dangerous. Recent experiments by these French bacteriologists are cited to show that diseased germs are carried in such material and may be taken up and preserved in the tissues of vegetables. In one instance water cress, head lettuce, and radish seed were sown in pots and the soil watered with diluted sputum that had been saved up for 40 days from a tuberculous patient. After a certain period pieces of the leaves of the vegetables grown were used to inoculate guinea pigs. As a result, 18 of the 30 inoculated pigs developed tuberculosis. Like experiments were also made with typhoid fever bacilli, and in every case, without exception, the typhoid bacillus was easily found in the leaves of the vegetables.

The chief purpose of the article is to show that better and cheaper vegetable crops can be grown by the rational use of commercial fertilizers, supplemented by stable manure, than with city sewage, and the former is less dangerous to health.

List of American varieties of vegetables for the years 1901 and 1902, W. W. Tracy, Jr. (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 21, pp. 402*).—All the varieties of garden vegetables, including field corn and herbs, but omitting potatoes and sweet potatoes, catalogued during the years 1901 and 1902 by 245 seed firms in the United States and Canada, have been arranged alphabetically under the different vegetables. The seed firms handling each vegetable are noted, and the synonyms of the different varieties given. The catalogue is intended primarily to serve the purposes of seedsmen and experimenters. It is hoped also that it may serve as a basis for shortening and simplifying our present long and complex list of varieties of vegetables and to prevent the duplication of old names.

The fog fruit or Lippia nodiflora as an economic plant, J. J. Thornber (*Arizona Sta. Bul. 45, pp. 234–238, figs. 2*).—This plant is stated to be a perennial, herbaceous, much branched, creeping plant, the stems of which root extensively at the node. In a lawn it gives the effect of white clover, though forming a more compact mass and not requiring the use of a lawn mower. Observations at the station indicate that it can maintain a continuous layer of green with a less amount of water than any other desirable plant within the Territory. It is sensitive to alkaline salts, and when these were applied at the rate of 1,700 lbs. to the acre the plants stopped flowering, turned a yellowish color, and began to die. When the salts were increased to 5,000 lbs. per acre, 95 per cent of the leaves died. It was stated that the ground upon which these experiments were conducted was already somewhat alkaline, so much so that roses would not flourish on it from year to year. Grazing animals appear to dislike the plant. Its chief value is as a sand and soil binder and as an ornamental in the lawn. When the plants were set 2 ft. apart each way in favorable situations, they completely covered the surface in one season's growth. It is thought to have especial value for planting along reservoirs and storm water embankments to bind the soil and prevent washing. Thus far it has not been observed to produce fertile seed in Arizona. In shaded lawns the plants tend to grow tall, lose their carpet-like formation, and seldom blossom. The plant is recommended for planting among rocks when it is desirable to hide them from view. It is usually propagated by cutting up the stems into 2-in. lengths and sowing them in drills during the spring or summer months. The station had more success in using rooted plants set about a foot apart in the row. The plants must be frequently watered until they have secured a permanent hold.

Ginger, G. Landes (*Jour. Agr. Trop., 2 (1902), No. 13, pp. 203–207; trans. in Queensland Agr. Jour., 11 (1902), No. 5, pp. 354–356*).—A detailed discussion is given of the culture of ginger in tropical countries and its preparation for the market.

Propagation of the mango, G. W. Oliver (*Florists' Exchange, 14 (1902), No. 16, p. 461, figs. 2*).—As the result of some experimental work in the grafting of mangoes the author states that the best time for grafting is when the new leaves are not far enough developed to show a bright green color. At this time the bark is most easily removed. The thick part of the stem a few inches above the ground should be chosen and a rectangular piece of bark about 1½ in. in length cut out. Another piece of bark taken from the variety which it is wished to propagate should be cut to a corresponding size and have a bud in its center. The scion bark should be taken from wood at least 2 years old. After the bark has been fitted in place a light coating of liquid grafting wax in which there is a large quantity of resin should be applied to the cut parts with a small brush, after which the bark should be immediately tied firmly in place with thick pieces of raffia. An 8-in. wide strip of strong wrapping paper is wound around the stem a few inches above the bud, extending downward to protect it, and tied with a cord. The author states that by this method a large percentage of successful unions may be expected.

The culture of onions in Holland, A. Pion (*Jour. Agr. Prat., n. ser., 4 (1902), No. 51, pp. 802, 803*).—A descriptive account of the onion industry of Holland. Silver skin onions are chiefly grown and the work is done mostly on a small scale by farmers and their families.

Peas put to the test, E. S. Brown (*Amer. Gard., 24 (1903), No. 420, p. 22, fig. 1*).—The tests with peas at the American Gardening trial grounds lead the author to recommend Surprise and Gradus for early, Gregory Surprise for second early, and Champion of England for third early. If only one pea could be grown the author would choose Surprise.

Manurial experiments with peas (*Gard. Chron., 3. ser., 32 (1902), No. 831, p. 391; abs. in Amer. Gard., 23 (1902), No. 418, p. 833*).—An increase in yield of 66⅔ per cent was obtained with the Daniel Best of All peas by dressing them with superphosphate and sulphate of potash at the rate of 3 lbs. of each spaded into 2 sq. rods of soil about 3 weeks before planting.

Cultivation of pepper, V. Sebastian (*Queensland Agr. Jour., 11 (1902), No. 5, pp. 356–358*).—Methods of cultivation and harvesting the pepper plant (*Piper nigrum*) are given.

Forcing tomatoes, A. C. Beal (*Illinois Sta. Bul. 81, pp. 503–524, figs. 5, dgms. 2*).—The manner of forcing tomatoes in winter and the yield obtained with several varie ties at the station are recorded. The author states that many tomato growers do not secure their first ripe fruits in the forcing house until 90 or 100 days after benching, when only about half this time is necessary. In one of the experiments seed of Combination and Yellow Prince varieties were sown in moderately rich soil October 23. They were potted in 2½-in. pots in a fibrous potting soil as soon as large enough, and shifted to 3½-in. pots about December 1. January 9 they were benched. At this time they were all showing open blossoms and were very much pot-bound. "The open blossoms set fruit and the plants continued to blossom at every third or fourth joint. Unchecked plants come into bearing later, as it takes time to fill the soil with roots and thereby check the excessive growth. On such plants the first fruit appears high up on the plant when it should be near the ground with a continuous succession of clusters up the stem."

The bench soil used was made of one-half rich garden loam and one-half well rotted compost. It was light in texture and fertile. Wood ashes at the rate of 20 lbs. per 100 sq. ft. were applied twice after the plants were in full bearing. The soil in the bench was 6 in. deep. The plants were set 2 ft. apart in rows 18 to 20 in. apart. The temperature of the forcing house varied from 70° F. at night to 75 to 80° on cloudy days and as high as 90° on sunny days. The plants were trained to single stems, using binder twine as a support. The leaders were pinched when the plants on the side benches had reached a height of 5 ft. and those in the center benches 8 ft. Shoots pushing out from fruit clusters, as is common in rapidly growing plants, were promptly removed. Hand pollination was practiced every other day when the pollen could be secured.

The first ripe fruits from Yellow Prince were secured February 25, or 47 days after benching, and from Combination February 28, or 50 days after benching. The average yield of Yellow Prince to June 11 was 2.85 lbs. per plant. There were about 16 fruits per plant, and they averaged in size 2.84 oz. The fruit of this variety was very uneven in size. There was no marked demand for the yellow sorts, and it is considered doubtful whether they are worth growing except a few plants for the sake of variety.

With the red variety Combination the yield on a north bench during the months March, April, and May averaged 4 lbs. per plant, or 17⅓ oz. per square foot of bench space. There were on an average 16½ fruits per plant, averaging 4.07 oz. in weight each. On a center bench set with this variety the yields during the months February to June averaged 8 lbs. per plant, or 2.4 lbs. per square foot of bench space. There was an average of 31 fruits per plant, weighing 4.1 oz. each.

Some of the plants in the above experiments received bottom heat, but the author states that the average size of the fruits and the yield were no greater with bottom heat than without it. During March the average weight of the fruit of Combination was 3½ oz., but with the increase in sunshine the average weight per fruit rose to over 4 oz.

During the winter of 1902 a test was made of 4 of the leading forcing varieties to ascertain their relative adaptation to winter forcing. Plants were sown August 20 and benched November 7. The first ripe fruit was picked December 24 from each of the varieties Combination, Lorillard, and Best of All. This was 47 days after benching. Eclipse did not ripen fruit until December 28 or 51 days after benching. The average total yields per plant for the different varieties were as follows: Combination, 4 lbs. 6 oz.; Lorillard, 4 lbs. 10 oz.; Best of All, 5 lbs., and Eclipse, 5 lbs. 4 oz. Best of All was the earliest and best of the 4 varieties as regards yield during the short, dull days of December, January, and February. Eclipse gave the largest total yield and produced the smoothest and most solid fruits.

Some data are given which show that fruits failed to set during long periods of cloudy weather because of the failure of the pollen to mature. This emphasizes the necessity of hand pollination whenever the sun does shine.

A spring crop was also grown in 1902. Seed was sown December 26, 1901, and the plants benched April 10. The first ripe fruits were obtained 52 days later. In addition to the above varieties, Stone and Roselind were also grown. With this crop Combination and Lorillard both yielded 3 lbs. of fruit per plant, Best of All 3 lbs. 6 oz., and Eclipse 3 lbs. 7 oz. The average yield per square foot for the 2 crops was about 2.37 lbs. When plants were trained to 3 stems a yield of 0.8 lb. per square foot was obtained, as compared with 1.25 lbs. for plants set the same day and trained to a single stem.

Aggregate atavic mutation of the tomato, C. A. WHITE (*Science, n. ser., 17 (1903), No. 419, pp. 76–78*).—The author notes that in one instance when seed of the Trophy tomato was planted in Habana, Cuba, the first crop produced tomatoes like the Trophy, but when seed from these was planted the resulting fruit was exactly like the small Cherry tomato. Similar results are reported from a parish in Louisiana, in which the seed grown in Louisiana produced the Cherry tomato instead of the much improved form from which the seed was obtained.

Edible native bulbs, E. BRAUNTON (*California Cult., 19 (1902), No. 26, p. 409*).—The use of some native California bulbs, such as wild onions, several species of "Mariposa lilies," wild hyacinth, *Cammassia leichtlinii*, and an introduced species of arrow root (*Sagittaria latifolia*), for food are noted.

Orchard studies. I. The fruit plantation. Pome fruits, W. B. ALWOOD (*Virginia Sta. Bul. 128, pp. 73–102*).—This is an alphabetically arranged catalogue of 416 varieties of apples, crab apples, pears, and quinces grown at the station during the past 14 years. "It has been carefully prepared to conform to correct nomenclature and spelling." It is stated that the station is prepared to furnish scions true to name, for purposes of study, etc., of such varieties as are in the orchard.

Climatic influences on the chemical composition of different varieties of apples in the autumn of 1900, as compared with the same sorts in the autumn of 1898, R. OTTO (*Landw. Jahrb., 31 (1902), No. 4, pp. 605–618*).—In the fall of 1898 18 varieties of apples were analyzed with reference to their sugar, starch, and acid content, and the specific gravity of their musts. These same varieties were again analyzed in 1900. The variations in the 2 series of analyses are pointed out, and a study made of the relation of the differences to the precipitation and temperature during the two seasons—March to October, inclusive. During this period the average monthly precipitation in 1898 was 58.6 mm., while in 1900 it was 61.4 mm. As regards temperature, there was 281.7° C. more heat during the months of June, July, September, and October in 1900 than in 1898. Two-thirds of the varieties ripened considerably earlier in 1900 than in 1898, in many cases 2 weeks and in some cases 22 and 45 days earlier. The specific gravity of the musts of half of the varieties was considerably higher in 1900 than in 1898. In 13 out of the 18 varieties there was a considerable increase in the sugar content, and with 17 varieties a decrease in the acid content in 1900 as compared with 1898. The difference in rainfall and temperature in 1900 is believed to largely account for the earlier ripening and the differences in the chemical composition of the apples.

Astrakhans exported successfully (*Canad. Hort., 25 (1902), No. 10, p. 398*).—A carload of Red Astrakhans was successfully sent to Glasgow. The carrier cases cost 22 cts. each and the freight and commission amounted to about 50 cts. per bushel. The fruit netted about $435 at Grimsby, Ontario.

The book of pears and plums, E. BARTRUM (*London and New York: John Lane, 1903, pp. 96, pls. 5, figs. 5*).—This is the eleventh number of the series of Handbooks of Practical Gardening, edited by H. Roberts, and is similar in scope and purpose to the preceding books. In addition to the culture of pears and plums, that of cherries and mulberries is also taken up. Information is given on the cooking and preserving of pears, plums, and cherries. The culture of all these fruits is treated from the standpoint of European conditions.

Fruiting of the hardy orange (*Amer. Gard., 23 (1902), No. 416, pp. 797, 798*).—It is reported that J. L. Normand, of Marksville, La., has succeeded in producing a hardy orange that will withstand a zero temperature. Ten years ago the hardy Trifoliata orange was crossed on the Satsuma variety of the sweet orange, for the purpose of securing hardiness combined with a palatable fruit. Some of the fruit obtained from this cross measured 6½ in. in circumference. It had a globular form and bright yellow color, with a smooth, thin, and clean skin. The seeds were fewer than in the ordinary sweet orange and the quality was very fair. The tree is said to be prolific. The foliage is that of the Satsuma while the stems and branches have the thorns of the Trifoliata.

Comparative examination of shipping navel oranges from the northern, middle, and southern parts of the State, G. E. Colby (*California Sta. Rpt. 1899–1901, pt. 2, pp. 243–251*).—This is a preliminary report on a systematic study of the progress of the maturing of navel oranges in the 3 citrus centers of the State of California. Analyses are reported of 5 samples of shipping navel oranges from the northern California citrus region, 7 from the San Joaquin Valley, and 16 from the southern citrus region. The averages of those packed during the month November 23 to December 23, compared with the standard for California navels, are shown in the following table:

Composition of California shipping navel oranges.

	Physical analysis.				Analysis of juice.			
	Average weight.	Rind.	Flesh.		Total solids (by spindle).	Total sugars.	Acid (citric).	Flavor (30 points).
			Pulp pressed.	Juice.				
	Grams.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	
Northern region	240	27.4	24.2	48.4	10.00	7.37	0.94	18
San Joaquin Valley region	261	27.7	24.4	47.9	11.90	8.78	1.22	19
Southern region	184	29.5	25.4	45.1	11.80	8.77	1.43	19
Standard for California navels	288	28.4	30.0	41.6	13.30	10.46	.97	25

The quantity of sugar in oranges is believed to be a safe guide to the degree of ripeness of the fruit. The ratio of acid to sugar in standard California navels is 1 per cent of acid to 10.5 per cent of sugar. In the table above the proportion varies from 1:7 or nearly 8 in all the shipping navels of November and December. This fruit is roughly estimated to be about four-fifths ripe.

"It seems improbable that the shipping fruit of November and December would ever ripen enough in transit, or afterwards in the market, to bring up the sugar to that produced in the orchard in later-picked fruit, or to that of the standard. Our experience with keeping oranges over 2 months has been that the increase in sugar is very small—only ⅓ of a point; e. g., from 10 to only 10.3 per cent total sugar."

In one instance a sample of oranges picked in the northern district December 5 contained 10.52 per cent of sugar. "This amount of sugar is only found in one other sample, the March 12 navel from Duarte, southern California region. Probably, as the northern orchards grow older, it will be more common for their earliest output to reach full maturity in early December. At any rate there seems to be a possibility of navels attaining very early full maturity in the northern citrus regions."

A table of analyses of shipping and fully ripe navels for the 3 citrus districts noted above for fruit picked between November 23 and March 12 is also included in the report.

Diagrams for packing citrus fruits, H. H. Hume (*Florida Sta. Bul. 63, folio, figs. 4, dgms. 34*).—Diagrams are given showing how different sizes of sweet oranges, Satsuma oranges, pomelos, mandarins, lemons, and limes should be packed. The size measurements of the boxes used are given in each case and brief suggestions given regarding picking, packing, and handling the fruit. Kumquats, it is stated, should be packed in quart baskets and shipped in strawberry carriers.

Smyrna figs, G. E. Colby (*California Sta. Rpt. 1899–1901, pt. 2, pp. 242, 243*).—Analyses are given of dried packed commercial Smyrna figs grown at Fresno in 1900 and of other dried but unpacked figs of the same crop. An analysis of imported packed Smyrna figs is given for comparison. The California packed Smyrna figs were very large, averaging ¾ oz. in weight, and had apparently not gone through the sweating process. The skin appeared thicker than on ordinary Smyrna figs and tougher. This fruit contained 33.43 per cent of water as compared with 21.06 per cent in the imported Smyrna figs. Recalculating the data on the basis of the same water content for both the comparative composition is as follows:

Composition of California and imported Smyrna figs.

	California grown.	Imported.
	Per cent.	*Per cent.*
Water	21.06	21.06
Ash	1.72	1.80
Proteids	4.37	4.06
Crude fiber	8.02	10.58
Fat	.91	
Sugar (grape and fruit)	63.92	62.50

This shows 1½ per cent more sugar and nearly ⅓ per cent more proteid for the California fruit than for the imported figs. Three varieties of unpacked figs ranged in water content from 23.02 per cent to 24.25 per cent; protein, from 3.94 per cent to 4.42 per cent; and sugar, from 62.5 per cent to 64.10 per cent. An analysis of the seed of the dried California-grown Smyrna fig Black Bulletin gave the following data: Water, 6 per cent; protein, 14 per cent; carbohydrates (showing a few starch grains), 13.5 per cent; fat, 34.4 per cent; fiber, 30.4 per cent; and ash, 1.7 per cent.

Culture and preparation of cacao in Trinidad, A. Élot (*Culture et préparation du cacao à la Trinidad. Paris: Augustin Challamel, 1900, pp. 31, pls. 2, figs. 3*).—The climate and soil of Trinidad are discussed, together with the methods observed in that island in cacao culture and preparation for market.

The tea plant, F. Coulombier (*L'arbre à thé. Paris: Augustin Challamel, 1900, pp. X+164, pls. 12, figs. 26*).—An elementary work on tea culture, beginning with the soil, climate, and planting of the seed, and including all the cultural operations to the fermentation, drying, packing, and disposal of the product. It is designed as a catechism in tea culture for planters.

Tests of potash fertilizers on vines, E. Marre (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 1, pp. 13, 14*).—By the use of sulphate of potash the average yield of grapes per hectare in 3 different experiments was increased 8, 11, and 20 per cent, respectively, over the yields obtained when only superphosphate and nitrate of soda were used.

The preparation of Malaga raisins, V. Sebastian (*Queensland Agr. Jour., 11 (1902), No. 5, pp. 343–346*).—The methods of preparing Malaga grapes, both in Spain and in California, are described in considerable detail.

Expedition to Central and South America, P. Preuss (*Expedition nach Central- und Südamerika. Berlin: Kolonial-Wirtschaftliches Komitee, 1901, pp. 452, pls. 20, figs. 78, plan 1*).—Under the direction of the Kolonial-Wirtschaftliches Komitee the author made an agricultural expedition into Central and South America. Following a description of several of the countries of South America and Mexico and of the characteristics of the agriculture and people in the different countries, the methods followed in the various districts in the culture, curing, and preparation for market of cacao, vanilla, Peru balsam, coffee, caoutchouc, gutta-percha, and nutmegs are given. The best practices in the case of each of these different crops are concisely summarized. The most attention has been given to the culture of coffee, cacao, and vanilla. An inventory of the plant material, etc., gathered on the journey is given in an appendix.

First year in tropical agriculture, G. SAUSSINE (*La première année d'agriculture tropicale. Paris: Augustin Challamel, 1900, pp. VI+316, figs. 84*).—An elementary school text-book on the general subject of tropical agriculture. A discussion of tools, stock, and the usual tropical plants is included.

Refrigerator cars (*Canad. Hort., 25* (*1902*), *No. 10, p. 407*).—It is reported that the Hanrahan refrigerator cars running between Grimsby and Ottawa have carried fruit as satisfactorily as the regular express cars.

Forcing branches of hardy shrubs (*Gardening, 11* (*1903*), *No. 248, p. 121*).—It is stated that branches of flowering shrubs may be brought into bloom during the winter by timely cutting and bringing into the greenhouse. The branches should be put into a barrel of water in a warm house and occasionally sprinkled with lukewarm water. The flowering almond (*Prunus amygdalus*) is especially suited for this work, and if wanted for the Christmas trade it should be cut and brought into the house the latter part of November. Forsythia and ribes may also be treated in the same manner. The forsythia requires a little longer time to come into bloom than the flowering almond, and the ribes about the same length of time. Hardy magnolias have also proved very satisfactory in this work. The white-flowered kinds are stated to produce flowers of a much finer and more satin-like texture than those grown out of doors. Magnolia flowers thus obtained are very durable, remaining in perfect condition sometimes for 8 to 10 days after the development of the flowers.

Correlation between the color of roots of carnations and the flowers (*Rev. Hort.* [*Paris*], *74* (*1902*), *No. 24, p. 567*).—It is stated that Chabaud has observed that carnations with red roots have red flowers, those with white roots produce white flowers or a white ground, and those with yellow roots produce yellow flowers or a yellow ground. The advantage to be gained from this knowledge is in the production of new varieties, the color of the flowers being indicated by the color of the seedling roots without waiting for the plants to blossom.

Raising gladiolus hybrids (*Amer. Gard., 23* (*1902*), *No. 418, p. 834*).—An account is given of the origin of the hybrid gladiolus Princeps, originated by D. W. Van Fleet. This is a very vigorous growing gladiolus of a true Salvia scarlet color. It was obtained from seed produced as a result of hybridizing *G. cruentus* from South Africa with a large-flowered garden variety of the Childsii strain. This gladiolus has been successfully grown nearly everywhere in the United States and in several European countries.

The book of orchids, W. H. WHITE (*London and New York: John Lane, 1903, pp. 118, pls. 11*).—This is the eighth in the series of Handbooks of Practical Gardening, edited by H. Roberts. The work discusses orchid houses, materials for potting, watering, diseases, etc., and gives brief accounts of 89 genera of orchids and their species, with many cultural suggestions.

Greenhouse construction and management, S. T. MAYNARD (*Massachusetts State Bd. Agr., Bul. 6, 1902, pp. 29–40, figs. 16*).—A popular discussion of materials, foundations, superstructures, painting, glazing, heating, ventilating, beds, benches, and insects.

FORESTRY.

Economics of forestry, B. E. FERNOW (*New York: Thos. Y. Crowell & Co., 1902, pp. XII+520*).—The author treats of forestry from the standpoint of political economy, aiming to present such information as is required to fully appreciate the proper rôle of forests and forest products in public affairs. This is one of a very few such books, and is probably the only one published in the English language which attempts a systematic discussion of the various topics treated. The book is not only a contribution to economic science, but also to the technical literature of forestry. The chapters are: The relation of the State to natural resources, the forest as a resource, the forest as a condition, forest and forestry defined, the business aspects of forest production, natural history of the forest, sylviculture, forest economy, principles and methods of forest policy, forest policies of foreign nations, the forest conditions of the United States, and the forestry movement in the United States. A bibliography and numerous notes, tables, and other references are added in the appendix.

Among green trees, JULIA E. ROGERS (*Chicago: A. W. Mumford, 1902, pp. XXII+202, pls. 25, figs. 196*).—This is a popular treatise describing a limited number of trees, and giving account of their physiological activity, their cultivation, and their systematic relations. In all about 125 different kinds of trees are described, the author aiming to include the more common and important trees growing in the States north of Virginia and Arkansas and east of the Rocky Mountains. The first part of the book is taken up with a nature-study consideration of trees, followed by chapters on the growth, reproduction, and other physiological functions of the trees. In the third part of the book the horticultural phases of tree growth are discussed, and directions given for planting, pruning, and protection of different kinds of trees. The book concludes with a description of the species as indicated above.

Studies of trees in winter, ANNIE O. HUNTINGTON (*Boston: Knight & Millet, 1902, pp. XVIII+198, pls. 79, figs. 3*).—A description is given of the winter aspect of a number of the deciduous trees occurring in the northeastern United States, with an introduction by C. S. Sargent, of the Arnold Arboretum. The characters upon which the recognition of the trees in winter depend are based largely upon the aspect of the trunk and branches, stems and twigs, leaf scars, bud scars, and shape and position of the buds. After describing these at length the author takes up and describes about 40 different kinds of trees, the best known of which are the horse chestnut, maples, ashes, walnuts, hickories, birches, beeches, chestnut, oaks, elms, sycamore, locusts, lindens, magnolias, willows, poplars, larch, etc. In addition to describing the winter aspect of these trees so that they may be readily recognized, notes are given on the distribution and general characters of the trees, together with statements regarding their value from economic and other standpoints. The book is an important contribution to our knowledge of the forest flora of a considerable portion of this country, since the species described are not by any means restricted to the northeastern part of the country.

Timber resources of the United States (*Tradesman, 48 (1903), No. 10, p. 74*).—According to recent estimates the merchantable timber of the United States, not including Alaska or the island possessions, aggregates 1,300,000,000,000 ft. B. M. Another estimate, based upon the annual product and the prospective life of the lumber industry from the standpoint of those who are familiar with the various sections, is somewhat lower—in round numbers 1,093,000,000,000 ft. B. M. This estimate takes into account only the timber which is adapted to use as saw timber, and does not take into consideration the production of cord wood, posts, poles, etc.

History of the lumber industry in the State of New York, W. F. FOX (*New York State Forest, Fish, and Game Com. Rpt. 1900, pp. 237–305, pls. 24, map 1*).—This is a reprint of Bulletin 34 of the Bureau of Forestry of this Department (E. S. R., 14, p. 575).

Manuring woodlands (*Farmers' Gaz., 61 (1902), No. 21, p. 388*).—A summary is given of investigations conducted on the continent of Europe in which the value of fertilizers in promoting forest growth was studied. In several examples the increased growth of the forest trees due to the dressings of fertilizers and cultivation much more than paid for the cost of application. In one experiment where similar plats of Scotch pine were planted, the first was retained as a check plat, the second received 700 lbs. of slag and 4 cwt. of kainit, while the third plat received 12 cwt. each of slag and kainit. The trees at the age of 8 years were from 30 to 40 in. in height on the unmanured soil, 50 to 69 in. in height on the plat receiving the smaller amount of fertilizer, and from 58 to 88 in. in height on the one receiving the larger application.

The use of nitrate of soda in sylviculture, J. HUBERTY (*Bul. Soc. Cent. Forest. Belg., 9 (1902), No. 7, pp. 411–421, pls. 2*).—The results of experiments with nitrate of soda upon the growth of forest trees in nurseries are given. The experiments were conducted in a number of regions with almost uniform results. The application of from 300 to 400 kg. of nitrate of soda per hectare had a marked effect upon the young trees, causing a greatly increased growth of spruces, white pine, oaks, maples, etc. The increase in growth was considered much in excess of the cost of the fertilizer and its application.

Tree growing in Nebraska, C. E. BESSEY (*Forestry and Irrig., 8 (1902), No. 11, pp. 453–456, figs. 2*).—A brief popular description is given of the recent undertaking of this Department in tree planting in western Nebraska. For this purpose 2 forest reserves have been proclaimed which embrace 212,000 acres. The tree planting which was undertaken in the Sand Hills of Holt County about 1890 by this Department is briefly described, and the trees are now said to be from 16 to 18 ft. high and growing vigorously. The predominating species are pines, and the results obtained seem to indicate the possibility of foresting this area.

Recent forest fires in Oregon and Washington, W. T. COX (*Forestry and Irrig., 8 (1902), No. 11, pp. 462–470, pl. 1, maps 2*).—An account is given of the severe forest fires which occurred during September in Washington and Oregon. In all more than 600,000 acres were swept by fire. In some regions not a single living tree remains to seed the burned areas. In a few places the Douglas spruce remains in sufficient abundance to secure the reproduction of the forest, but cedar, arborvitæ, and hemlock, being less resistant to fire, were invariably killed. The money loss in both States is estimated at more than $12,750,000.

A plantation of European larch, A. F. HAWES (*Forestry and Irrig., 8 (1902), No. 11, pp. 472–474, fig. 1*).—An account is given of a small plantation of European larch near New Haven, Conn., which was planted about 23 years ago, the trees being imported from Europe. When planted the trees averaged 2½ ft. in height and were set in rows 4 ft. apart in each direction. A study was made of the stand of trees and the value estimated. The present value of the plantation is estimated to be about $80 per acre. A large proportion of trees has been suppressed owing to close planting. Through ignorance of the intolerance of larch to shade this experiment has proved a failure, where had more open planting been adopted the results might have been profitable.

A contribution to the knowledge of the timber of the yew tree, G. THOMS (*Korbl. Naturforsch. Ver. Riga, 45 (1902), pp. 28–33*).—The yew tree (*Taxus baccata*) is said to live to a great age and attain a diameter of a meter or more. Its distribution is briefly indicated, and analyses of the ash of the wood are given. The specific weight, as compared with that of oak, beech, ash, birch, etc., is shown to be greater than all those woods.

The mesquite, S. J. HOLSINGER (*Forestry and Irrig., 8 (1902), No. 11, pp. 447–453, figs. 5*).—A description of the habits and uses of the mesquite (*Prosopis juliflora*) is given. While as a rule this plant over the greatest extent of its range does not attain tree-like proportions, yet in parts of Colorado and Arizona it is met with growing to a height of 35 to 65 ft., with a diameter of 18 to 30 in. or more. As an economic plant it is one of the most valuable of the southwestern region. Its wood is close, hard grained, and adapted to various uses; while as an ornamental and shade tree it is superior to many other species. On account of the great extent of the root development it is considered valuable to protect soils against erosion, and its reproduction and growth as coppice is rapid and the second growth wood which matures in from 10 to 20 years is said to be better than the original growth. In addition to its timber value, the beans which are produced in great abundance have a distinct value both as food and feeding stuff. The bark also contains a high percentage of tannin which is locally used, and a gum which is capable of making fine mucilage exudes from the branches. The distribution of the mesquite is indicated and its related species, the screw bean (*P. pubescens*), is also briefly mentioned.

Difficulties and errors in stem analysis, A. S. WILLIAMS (*Forestry Quart., 1 (1902), No. 1, pp. 12–17*).—A number of the difficulties which are met with in attempting stem analysis, and the sources of a number of errors are pointed out.

DISEASES OF PLANTS.

Spore resistance of loose smut of wheat to formalin and hot water, W. STUART (*Proc. Indiana Acad. Sci. 1901, pp. 275–282*).—On account of the apparent difference in the resistance of the spores of loose smut to various media, a series of experiments was undertaken in which spores from smutted heads were subjected to various germination tests. Before being placed to germinate, they were treated with varying strengths of formalin and different temperatures of hot water for varying periods of time. As a result of the experiments it was concluded that the smut spores themselves are easily destroyed by either formalin or hot water treatments, but owing to the somewhat impervious nature of the seed coats of wheat the spores frequently find lodgment in the interstices and it is difficult to reach and kill them in the ordinary methods of treatment. To render the seed coats of wheat susceptible to such agencies as are commonly employed for the prevention of smut, it is recommended that the seed should be soaked for several hours in cold water prior to the treatment. When so treated, a short immersion in an 0.18 per cent solution of formalin or 10 minutes in water at 120° did not materially influence the germination of the wheat and destroyed the smut.

Experiments in the prevention of smut in oats, T. JOHNSON (*Jour. Dept. Agr. and Tech. Instr. Ireland, 2 (1902), No. 3, pp. 426–436, figs. 2*).—An account is given of experiments conducted for the prevention of oat smut (*Ustilago avenæ*) in which the relative efficiency of potassium sulphid, copper sulphate, formalin, hot water, and the "sar" or sodium sulphid solution, previously described (E. S. R., 10, p. 154), were tested. As a result of the experiments it is shown that smut of oats, which is very prevalent in the west of Ireland, can be almost entirely prevented by treatment of the seed, and when the cost of application and efficiency is considered the "sar" or sodium sulphid solution is preferred.

The specialization of Erysiphe graminis, E. MARCHAL (*L'Ing. Agr. Gembloux, 13 (1902), No. 1, pp. 10–13*).—An account is given of a series of experiments conducted with *Erysiphe graminis* to determine the possibility of cross inoculations of this fungus from one host to another. There are said to be about 55 species of grasses affected by this fungus, and the experiments briefly outlined were conducted from March to June, 1902. Plants of wheat, barley, rye, and oats were cross inoculated with the Erysiphe from different hosts. In about 15 days an abundant development took place but only in those cultures where the spores had been taken from host plants of the same species. A series of experiments was then undertaken in which the attempt was made to transfer the mildew from various wild grasses to the cultivated cereals. As a result of all his experiments, the author is led to conclude that there are a number of well defined forms of *Erysiphe graminis* which are specialized to their respective hosts. Morphologically no differences can be detected, but infection experiments invariably failed when the species of host plants were not rather closely related.

On the specialization of Erysiphe graminis, E. Marchal (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 3, pp. 210–212*).—A report is given of studies made of this common grass mildew in which reciprocal inoculations were made with material obtained from a number of different host plants. The results of his experiments, which have been already noted above, show that *Erysiphe graminis* has become specialized on a number of hosts. Descriptions are briefly given of the specialized forms, to which the author gives names based upon the principal host plants. The form species recognized are *tritici*, *hordei*, *secalis*, *avenæ*, *poæ*, *agropyri*, and *bromi*.

Cotton disease in Egypt, G. Delacroix (*Agr. Prat. Pays Chauds, 2 (1902), No. 8, pp. 135–143; Jour. Agr. Trop., 2 (1902), No. 14, pp. 231–233*).—A description is given of a cotton disease in Egypt, the diseased material of which was sent to the author for determination. From the description of the disease furnished the author, and the examination of the infected material, he is led to believe that the disease is identical with that known in the United States as cotton wilt. A study of the parasite offers no differences so far as he can determine from that described as *Neocosmospora rasinfecta* (E. S. R., 11, p. 944). The author states that the resistance of Egyptian cotton to disease observed in this country does not seem to have been noted in Egypt.

Cucumber and melon leaf blotch (*Jour. Bd. Agr. [London], 9 (1902), No. 2, pp. 196–198, pl. 1*).—The fungus causing this disease was first observed and described as *Cercospora melonis* in 1896, and has spread with marked rapidity. It attacks the foliage, causing small pale green spots on the upper surface of the leaf. These gradually increase in size, passing from gray to a brownish or yellowish color. Frequently the leaf becomes dry and crumbles within 24 hours of the first appearance of infection. Such dead leaves are a source of continued infection and should be destroyed. The disease seems to assume destructive tendencies only upon plants grown under glass where high temperature and excessive moisture are present. Such conditions result in the production of soft growth rendering the attack of the fungus possible. The distribution of the disease through shipping boxes has been demonstrated. For preventive measures the spraying with potassium sulphid is recommended. The diseased leaves should be removed and burned, and after the diseased crop is removed the soil should be thoroughly disinfected.

The finger-and-toe in turnips (*Jour. Bd. Agr. [London], 9 (1902), No. 2, pp. 145–149, fig. 1*).—A description is given of the club root of turnips caused by *Plasmodiophora brassicæ*. This disease in addition to attacking turnips affects nearly all plants belonging to the family Cruciferæ. As means for the prevention of the disease the application of fresh burned lime to infected land is recommended. In order to secure the best results this should be spread on the land 18 months or more before the turnip crop is sown. Other forms of lime are more or less effective but none are as efficient as the common burned limestone, which is slaked just before spreading. In addition to the treatment with the lime the rotation of crops is recommended, and turnips or similar crops should not occupy the land oftener than once in 8 years. Experiments have shown that acid fertilizers encourage the development of this disease and should in no case be used. The author states that while no varieties seem entirely immune to disease some appear markedly resistant.

Notes on apple rusts, H. H. Whetzel (*Proc. Indiana Acad. Sci. 1901, pp. 255–261*).—Notes are given on the general prevalence of apple rust throughout the region, and attention called to the fact that while the fungus was exceedingly abundant on cedars during 1900 it was markedly scarce the following season. The Rœstelia stage was sufficiently abundant for the purposes of investigation during the summer of 1901, although not as abundant as the previous year. An experiment was attempted in which parts of apple trees were inclosed with cheese cloth just as the buds were beginning to swell and when the teleutospores had not yet ripened on the cedars. The protected leaves were examined from time to time, and while infected to some extent they did not exhibit nearly as many spots as the unprotected portions of the tree. It is believed that the infection was caused through the development of the sporidia of the fungus and not directly through the distribution of the teleutospores. Laboratory experiments were conducted with the teleutospores, in which it was found that the best germination took place on slides which were moistened and placed in the sunlight under bell jars. This allowed the spores to dry slowly, thus affording natural conditions for sporidia production. The galls produced on the cedar are believed to be perennial. The mycelium passing the summer in the old gall produces new outgrowths and a second crop of spores in the following spring. In this way the occurrence of the Rœstelia stage of the disease in 1901, following an almost total disappearance of the cedar apples, may be explained. Marked differences are reported on the immunity of different varieties of apples as observed in the different orchards.

Pink rot, an attendant of apple scab, J. CRAIG and J. M. VAN HOOK (*New York Cornell Sta. Bul. 207, pp. 161–171, pls. 2, figs. 5*).—Attention is called to a very destructive rot which accompanies and follows apple scab. This is caused by a parasite which appears only on apples infested with scab. It is first noticed as a thin gray mildew, always thicker around the margin of the scab spots. Later it assumes a pink color, due to the maturing of the fungus. The apple scab fungus as it matures ruptures the skin of the apple and the edges are left somewhat upturned, and it is through these broken surfaces that the pink fungus gains entrance. The first appearance on the apples is the browning of the epidermis about the scab spots. This gradually extends in all directions, until by the merging of the spots large areas or the entire surface may be involved. As the spots increase in size the surface becomes sunken by the dissolution of the solid parts of the apple underneath, as well as the evaporation of water through the spots. The fungus, which has been identified as *Cephalothecium roseum*, is not ordinarily considered as a parasite, but usually grows upon decaying vegetable matter. The atmospheric conditions for spraying were very unfavorable during this season, and as a consequence there was an unusual development of apple scab. The injury caused by the scab made possible the abundant development of the pink fungus. Good tillage, careful pruning and spraying, which will result in the production of apples free from scab, would also prevent the occurrence of this pink rot. Experiments were carried on to test the practicability of disinfecting apples by dipping or fumigating them to prevent the growth of this fungus. Samples were dipped in solutions of copper sulphate and formalin and were fumigated with formaldehyde gas and with vapors of sulphur, the best results being obtained where the formaldehyde gas was used. Storing the apples at low temperature will retard the development of the pink rot, but it is probable that removing fruit from cold storage would increase the rapidity of the decay.

The bitter rot of apples, H. VON SCHRENK and P. SPAULDING (*Science, n. ser., 16 (1902), No. 408, pp. 669, 670*).—A description is given of recent investigations on the origin and distribution of the bitter rot of apples, a note on which has been given elsewhere (E. S. R., 14, p. 367). It is claimed that the bitter rot can be traced to canker spots on the limbs of the apple tree. Spores from apples inoculated into living apple branches produced the canker, and healthy apples reinoculated from the canker produced the bitter-rot disease on the fruit. Inoculations of pure cultures gave similar results, and it appears that there is a causal relation between apple cankers found in the orchard and the bitter-rot disease. It is considered probable that the fungus *Glœosporium fructigenum* is capable of living both in the bark and fruit of the apple. This fact is important in assisting apple growers to combat the disease.

Brown rot of stone fruits, F. T. BIOLETTI (*California Sta. Rpt. 1899–1901, pt. 2, pp. 330–333, fig. 1*).—The brown rot of stone fruits caused by *Monilia fructigena* has been observed in California for some time, but until 1900 did not occasion very serious damage. During that summer 50 per cent of the prune crop in one locality was destroyed and in another it was estimated that 25 per cent of the apricots were seriously affected. As there appeared to be a tendency on the part of the disease to spread throughout the State, a brief report is given describing the disease and giving suggestions for its preventive treatment. It is recommended that all mummy fruits be collected and destroyed and trees given thorough spraying with Bordeaux mixture, one application to be given before the blossoms open and a second after the fruit has set. It is believed that the use of a winter wash consisting of lime, salt, and sulphur would doubtless be effective against the brown rot. In the case of late ripening varieties a third spraying should be given after the others as recommended above, but in this case a copper acetate solution is to be preferred, as the Bordeaux mixture would stain the fruit at this time.

A new disease of bananas (*Queensland Agr. Jour.*, *11* (*1902*), *No. 4*, *p. 284*).—A brief note is given of the nematode disease of bananas in Egypt, which has been noted (E. S. R., 14, p. 581). This disease is said to have been noted some time since in Australia and to have been investigated by the pathologist of the department of agriculture of that country.

Brunissure of the grape, J. Dufour (*Prog. Agr. et Vit.* (*Éd. L'Est*), *23* (*1902*), *No. 36*, *pp. 279*, *280*).—According to the author the disease known in France as brunissure has been attributed to a number of different causes, among them fungi, various insects, physiological causes, etc. In the present contribution he gives a description of a form of the disease which has been quite prevalent during the past season, which is characterized by the presence of minute larvæ on the surface of the diseased leaves. When examined microscopically these larvæ seem to resemble to a considerable degree those of *Phytoptus vitis*. There are said also to be certain acarids of the genus Phyllocoptes which cause a form of brunissure on cherries, plums, nut trees, etc. It is believed that these insects are widely distributed and that they are the evident causes of certain forms of the disease which is generally described under the name brunissure.

A cause of brunissure, L. Ravaz (*Prog. Agr. et Vit.* (*Éd. L'Est*), *23* (*1902*), *No. 43*, *pp. 481–486*).—According to the author's investigations brunissure seems to attack certain varieties of the grape more than others, and apparently those grafted upon certain stock are the most susceptible to the disease. There appears to be a relation also between the disease and the productivity of the varieties, those yielding most abundantly being most subject to the disease. The tendency to disease may be diminished by close pruning so as to reduce the production of fruit, and by stimulating the vegetative growth through the use of fertilizers, irrigation, and cultivation, or by the selection of vigorous resistant stocks.

On the possibility of combating the downy and powdery mildew of grapes by a combined fungicide, J. M. Guillon (*Compt. Rend. Acad. Sci. Paris*, *135* (*1902*), *No. 4*, *pp. 261*, *262*).—A study has been made of mixtures of sulphur and the principal copper fungicides in order to ascertain whether a combination of the two might not be practically useful in controlling both these diseases. In general the sulphur, either sublimed or triturated, remained on the surface of the liquid, but the author found that thoroughly mixing the sulphur with the lime of the Bordeaux mixture or the carbonate of soda in Burgundy mixture would cause its complete suspension in the liquid for a considerable time. The suspension of the sulphur can be further brought about by the use of a small amount of resin. When used with verdigris the sulphur should be thoroughly mixed and the liquid of the fungicide kept agitated. In no case was the adhesive property of the fungicide lessened by the presence of the sulphur, and the mixture of sulphur and copper seemed to be advantageous for the control of both diseases.

Experiments for the prevention of gray rot, L. Ravaz (*Prog. Agr. et Vit.* (*Éd. L'Est*), *23* (*1902*), *No. 35*, *pp. 250–253*).—During the past season the attack of

Botrytis cinerea on certain varieties of grapes has been of exceptional severity. Usually this mold is saprophytic, but under the conditions which have recently existed it has become a parasite of great activity, destroying the fruit in all stages of development. The application of liquid fungicides to the grapes is said to be attended with certain difficulties, and the author has investigated the subject of powders which do not offer the same objection. He recommends the use of either a mixture of 90 per cent gypsum and 10 per cent copper sulphate or 80 per cent gypsum and 20 per cent neutral verdigris. If it is found desirable powdered sugar may be added, in which case the copper will be present in the form of a sucrate.

On the resistance of Botrytis cinerea to metallic poisons, L. DEGRULLY (*Prog. Agr. et Vit.* (*Éd. L'Est*), *23* (*1902*), *No. 38, pp. 330–332*).—An editorial review is given of investigations on the resistance of a number of molds to metallic poisons. The experiments reported were conducted with *Mucor mucedo*, *Aspergillus niger*, *Botrytis cinerea*, and *Penicillium glaucum*. The spores of these fungi were cultivated on the media containing different quantities of salt, and the Penicillium was found to be the most resistant. The toxicity or poisonous property of the metals in the increasing order of progression was manganese, zinc, copper, iron, lead, nickel, cadmium, cobalt, mercury, and thallium, the sulphates of the metals being the forms used. In another series of experiments it is stated that spores of Penicillium which germinate in the presence of metallic poisons give a growth, the spores of which are more resistant than those of the first generation. In this way it seems that molds in general are able to increase their resistance to toxic substances. The importance of this on the treatment for the prevention of the disease of grapes due to *Botrytis cinerea* is very great.

A form of Glœosporium nervisequum on plane trees, J. BEAUVERIE (*Ann. Soc. Bot. Lyon, 26* (*1902*), *p. 5; abs. in Bot. Centbl., 90* (*1902*), *No. 28, p. 29*).—The ordinary form of *Glœosporium nervisequum*, which is said to be identical with *G. platani* and *G. valsoideum*, is found only upon the leaves of the host plant. A new form is described which attacks the branches and twigs, the mycelium entering the cortical layer and extending to the medullary rays and pith. The pycnidia are formed in the cortex. When the attack is severe the trees are frequently entirely destroyed.

Concerning Tuberculina persicina, E. MARCHAL (*Bul. Soc. Cent. Forest. Belg., 9* (*1902*), *No. 5, pp. 332, 333*).—The æcidia produced upon *Pinus sylvestris* by *Cronartium asclepiadeum* are said to be frequently attacked by the fungus *Tuberculina persicina* to the complete obliteration of the characteristics of the former fungus. It has been previously claimed that Tuberculina is parasitic upon the Cronartium, but the author doubts the accuracy of this statement and thinks that it is merely an association, the Tuberculina being able to live only in tissues which have been disorganized by the rust fungus. A related species (*T. maxima*) is said to be associated with the æcidia produced on the white pine by *Cronartium ribicolum.*

The rust of spruces, E. MARCHAL (*Bul. Soc. Cent. Forest. Belg., 9* (*1902*), *No. 5, pp. 333, 334*).—A brief description is given of the rust of spruces produced by *Chrysomyxa abietis*. This disease is said to prefer moist localities and is most abundant in valleys. The meteorological conditions which occur in the spring at the time of the germination of the teleutospores are said to exercise a marked influence on the disease, it being favored by considerable humidity. The disease was present in 1899 and in 1900, but in 1901 it had almost entirely disappeared.

Two fungus diseases of the white cedar, J. W. HARSHBERGER (*Proc. Acad. Nat. Sci. Philadelphia 1902, pp. 461–504*).—The white cedar (*Cupressus thyoides*), which ranges from Maine to Florida and west to the Mississippi, is said to be the host plant for 19 species of fungi, most of which are not of serious importance. The only species considered as serious parasites are *Gymnosporangium biseptatum* and *G. ellisii.* These 2 fungi are very prevalent on the white cedar in New Jersey. The swellings produced by *G. biseptatum* are usually nodose, increasing year by year until they attain a size of 6 to 8 in. in diameter. Those produced by the second species are never as thick, but the involved branches radiate in a fan-like growth resembling witches' brooms. The effect of the different fungi upon the tissues of the host is shown, and the belief is expressed that the fungi cause marked metabolic changes in the stem, accompanied by the considerable accumulation of resin and other substances.

Studies of some tree-destroying fungi, G. F. Atkinson (*Trans. Massachusetts Hort. Soc. 1902, I, pp. 109–130*).—A report is given of a lecture, in which the author described *Polyporus borealis*, *P. sulphureus*, *P. igniarius*, *Trametes abietis*, and *Rhizoctonia* sp. The effect of these different fungi upon the trees is shown and the methods of growth and distribution of the fungi are indicated.

Suggestions for the removal of epiphytes from cacao and lime trees, A. Howard (*West Indian Bul., 3 (1902), No. 2, pp. 189–197*).—A discussion is given of the presence of epiphytes upon cacao, lime, and other trees, and suggestions given for their removal. The larger forms, like ferns, orchids, etc., are best removed by hand, while the smaller ones can probably be best removed by spraying the trees with a 6 per cent solution of copper sulphate or one of the resin compounds.

The general treatment of fungoid pests, A. Howard (*Imp. Dept. Agr. West Indies, Pamphlet No. 17, 1902, pp. 43, figs. 5*).—A general discussion is given of the various diseases caused by fungi, and suggestions given for their prevention.

ENTOMOLOGY.

Some miscellaneous results of the work of the Division of Entomology (*U. S. Dept. Agr., Division of Entomology Bul. 38, n. ser., pp. 110, pls. 2, figs. 9*).—*The southern grain louse, T. Pergande* (pp. 7–19).—Notes are given on the appearance and habits of this insect as learned through correspondence and newspaper clippings. The life history of the species is not well understood. A description is given of the wingless and migratory females. A number of natural enemies are known, including ladybirds and an internal parasite, *Lisiphlebus tritici*. No artificial remedies are effective.

Report of an investigation of diseased cocoanut palms in Cuba, A. Busck (pp. 20–23).—An investigation of the diseased cocoanut palms in Cuba was carried out with the result that a fungus (*Pestalozzia palmarum*) was found to be the primary cause of the disease. The trunk is destroyed within 3 months after the beginning of the attack and is then completely disintegrated by white ants and other insects. For preventing the spread of the disease the author recommends cutting down and burning diseased palms. The insects found upon the cocoanut palm were few in number and of little or no economic importance.

The palm and palmetto weevils, F. H. Chittenden (pp. 23–28).—Descriptive economic and biological notes are given on *Rhynchophorus palmarum* and *R. cruentatus*. A number of insects were found associated with the first named species, among which were 2 species of mites which are doubtless of some value in destroying the weevils. *R. cruentatus* has been observed at Ft. Ogden, Fla., on seedling dates, the trunks of which it thoroughly destroyed. The treatment recommended for this insect is both cultural and mechanical. It is suggested that young trees or wild species of palm be cut down or wounded; the sap which exudes from wounded trees strongly attracts the beetles and they may thus be easily captured.

Notes on the rhinoceros beetle, F. H. Chittenden (pp. 28–32).—Notes are given on the habits and life history of *Dynastes tityus*. The larva of the insect is described for the first time and descriptions are given of the other stages.

Notes on enemies of mushrooms and on experiments with remedies, A. Busck (pp. 32–35).—The chief enemies of mushrooms are considered as being snails, roaches, dipterous maggots, and mites. Snails may be captured under loose boards; roaches may be driven away by pyrethrum and bisulphid of carbon; the attacks of maggots may be partly prevented by screening windows and by liberal use of pyrethrum. The greatest damage to mushrooms is due to *Tyroglyphus lintneri*. A number of remedies were tried without encouraging results. These remedies include bisulphid of carbon, pulverized sulphur, vapors of sulphur, pyrethrum powder, hydrocyanic-acid gas, tobacco dust, chlorid of lime, gasoline, and moisture. Further experiments will be tried for the purpose of determining an effective remedy.

Notes on Colorado insects, A. N. Caudell (pp. 35–38).—Brief notes on *Nysius minutus*, beet army worm, bean ladybird, apple flea-beetle, cabbage looper, cottonwood leaf-beetle, *Clisiocampa fragilis*, *C. tigris*, bollworm, and grasshoppers.

Grasshopper notes for 1901, L. Bruner (pp. 39–49).—Detailed notes are given on the itinerary of the author through Nebraska, Colorado, and Wyoming to determine the extent of grasshopper ravages. A large number of species of grasshoppers were observed, among which *Melanoplus differentialis*, *M. bivittatus*, *M. atlanis*, *M. packardii*, and *M. femur-rubrum* were most important. Other species were found on prairies and uncultivated grounds feeding upon wild plants. In some localities the grasshoppers appear to breed chiefly in alfalfa fields and along roadsides. The author believes that the destruction of birds is in some localities responsible for the great increase in the number of grasshoppers. The other causes for this abnormal increase are the abandonment of cultivated fields, allowing weeds to grow too extensively, failure to burn prairies, and growing alfalfa without disking the ground in the spring.

Killing destructive locusts with fungus diseases, L. Bruner (pp. 50–61).—A detailed account is given of the various fungus diseases which have been used in destroying locusts. The author experimented with the most of these parasitic fungi and concludes from his experiments that the best results are obtained from the use of native fungi, and that the value of introduced fungi in destroying locusts has been greatly overestimated. It is believed that the cultures distributed from Australia under the name *Mucor racemosus* are properly labeled, but that they do not contain the fungus which caused the death of the grasshoppers from which the cultures were made.

The conflict of the Russian Zyemstvos with the enemies of agriculture, V. Moracherski (pp. 61–66).—An abstract of a paper previously noted (E. S. R., 11, p. 658).

The tobacco-stalk weevil, F. H. Chittenden (pp. 66–70).—Notes are given on the habits and life history of this insect, based partly on the correspondence from L. H. Shelfer in Texas. The species is *Trichobaris mucorea* and is closely related to *T. insolita*, which occurs in Florida. In controlling this insect Paris green is found effective. It was also suggested that the tobacco stems should be destroyed as soon as the leaves are cut.

The leaf-mining locust beetle, with notes on related species, F. H. Chittenden (pp. 70–89).—*Odontota dorsalis* is said to have been unusually destructive in the District of Columbia, Maryland, and Virginia during the past season. The injury was most severe to young trees. The beetle is described in its different stages and notes are given on the geographical distribution, food plants, life history, habits, and natural enemies of the species. The beetles may be destroyed by application of an arsenical spray. Notes are also given on *O. rubra*, *O. nervosa*, *O. bicolor*, *O. horni*, *O. notata*, *O. californica*, *O. scapularis*, *Microrhopala vittata*, *M. xerene*, *M. melsheimeri*, *M. floridana*, *Octotoma plicatula*, *O. marginicollis*, and *Stenopodius flavidus*.

The bulletin also contains general notes on the introduction of *Liparis monacha* in America, the loss caused by the variegated cutworm in 1900, Mediterranean flour moth in Minnesota and other States, angoumois grain moth in 1901, recent injury by the cigarette beetle, the occurrence of *Dermestes cadaverinus* in the United States, blister beetles injurious to fruit trees, vine chafers, Colorado potato beetle in the South, rice weevil, cane borer, and various other notes from correspondents.

Elementary studies in insect life, S. J. Hunter (*Topeka, Kans.: Crane & Co., 1902, pp. XVIII + 344, pls. 2, figs. 259*).—This volume contains an account of insect metamorphosis, special senses, protective devices, solitary life, social life, instinct, mutual relations of plants and insects, injurious and beneficial insects, the extent of insect life, geographical distribution of insects, structure, collection and classification of insects, laboratory exercises, habits of ants, form and function of different parts of insects, and an appendix on methods of dealing with injurious insects. In this appendix economic plants are arranged in alphabetical order with brief notes on their chief insect pests. The volume contains many original illustrations and is written for the purpose of inducing students to make personal observations in the field and laboratory on some of the more important biological problems presented by insects.

Report of the State entomologist, W. M. Schöyen (*Aarsbr. Offent. Foranstalt. Landbr. Fremme, 1901, I, Statsforanstalt., pp. 90–129, figs. 27*).—As in previous reports by the author, notes are given on the more important insect pests and plant diseases observed in Norway during the year. The chief pests discussed in the report include *Hydrellia griseola*, injurious to cereals; oat smut; wheat rust; *Charæas graminis*, *Adimonia tenaceti*, and *Tipula oleracea*, injurious to grasses; *Plutella cruciferarum*, *Mamestra brassicæ*, and *Limax agrestis*, injurious to cabbages and related plants; codling moth, *Argyresthia conjugella*, *Aporia cratægi*, *Hyponomeuta variabilis*, pear psylla, apple plant louse, and oyster-shell bark-louse, injurious to fruit trees; *Nematus ribesii*, *Zophodia convolutella*, and *Puccinia ribis*, injurious to gooseberries and currants. Brief notes are also presented on the insect and fungus pests of shade trees, conifers, ornamental plants, and also upon a number of household insects.

Studies on insects, E. Fleutiaux (*Agr. Prat. Pays Chauds, 1 (1902), No. 6, pp. 768–773; 2 (1902), No. 7, pp. 111–124, figs. 7*).—Notes are given on a number of beetles which have been introduced into Tunis which are likely to be transported by means of shipping.

Experiments were tried with a race of silkworms known as Massourah, from Asia Minor. This race proved to be a very profitable one in Tunis, and it is recommended that more extensive experiments be tried with it.

In combating *Physopus rubrocincta*, an enemy of the cacao, it was found that best results were obtained from the use of kerosene emulsion. Notes are given on the use of sulphur fumes generated by special machines devised for that purpose in the destruction of rice weevils and other insects in various situations. A list is given of insects collected by Landes and Touin at St. Pierre. Notes are given on *Sphenophorus liratus* injurious to bananas, and a number of insects especially injurious to agriculture in Madagascar.

Injurious insects, E. Fleutiaux (*Agr. Prat. Pays Chauds, 2 (1902), No. 9, pp. 377–380*).—Brief notes are given on a number of insects injurious to tobacco and bamboo, and mention is made of certain other butterflies and injurious Diptera. In Madagascar tobacco was injured by *Dermestes bicolor*, *Ptinus fur*, various species of cockroaches, and other insects.

Corn billbugs in Illinois, S. A. Forbes (*Illinois Sta. Bul. 79, pp. 435–461*).—Injury to corn from billbugs has been found to prevail in Illinois chiefly under one or the other of 3 conditions, viz: (1) Where swamp lands are broken up in the spring and planted to corn; (2) where such land is poorly cultivated, allowing coarse grass to grow up again; and (3) where timothy sod is plowed under in the spring and immediately planted to corn. The largest species of billbugs breed chiefly in the bulbous roots of certain coarse sedges or rushes, while the majority of the medium-sized species breed largely in timothy fields. This explains the danger of planting corn immediately after breaking up such land. As a general preventive measure against injury from billbugs it is recommended that grass lands infested by these insects be plowed in the early fall or summer before the time for the hibernation of the adult insects. This has been found by experience to be a quite effective remedy for preventing infestation by billbugs. Detailed descriptive economic and biological notes are given on a number of species of these insects, including *Sphenophorus parvulus, S. placidus, S. ochreus, S. pertinax, S. cariosus, S. scoparius, S. sculptilis,* and *S. robustus. S. parvulus* is said to hibernate in the adult stage. The beetles deposit their eggs in the early summer, the larvæ hatch in June and pupation takes place in July. The adults appear late in July or during August. The most injurious species of those mentioned is *S. ochreus.* A brief bibliography of recent literature on these insects is appended to the bulletin.

Extermination of the cane grub, A. J. Boyd (*Queensland Agr. Jour., 10* (*1902*), *No. 6, pp. 468, 469*).—The ravages of the cane grub are reported to have been unusually severe. This condition is believed to be attributable in part to the great destruction of moles which took place in consequence of the severe drought. The feeding habits of the mole are briefly considered and notes given on its natural enemies. It is believed that the mole is one of the most valuable helps to the cane grower in preventing damages from the cane grub.

Cleonus punctiventris and green muscardine, S. G. Toporkov (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *3* (*1902*), *No. 1, pp. 1–28*).—The author found that this beetle does not feed upon grass when it first appears in the spring, and in this respect the author's observations do not agree with those of Danysz. During the winters of 1900 and 1901 it was found that the beetles did not penetrate into the soil below a depth of 45 cm. and that 87 per cent of the beetles were found in the layer of soil between 9 and 36 cm. below the surface. According to the author's observations there is but 1 generation. The larvæ and beetles are more quickly and seriously affected with the muscardine when they occur in crowded conditions. It is therefore recommended that sugar beets be planted at greater distances from one another in order to prevent the accumulation of the insects in large masses at intervals so great that the fungus does not succeed in passing from one mass of insects to another. The author believes that the muscardine, which is found in the government of Kiev, is not the white variety but rather the green. In combating the attacks of *Cleonus punctiventris* upon sugar beets it is recommended that a rotation of crops extending over 2 or 3 years be adopted in the place of one occupying from 4 to 6 years. This would prevent the destruction of the muscardine in the soil between any 2 successive crops of sugar beets.

Cleonus punctiventris and green muscardine, S. G. Toporkov (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw*], *2* (*1901*), *No. 2, pp. 134–166*).—In combating the attacks of this insect upon sugar beets, the author believes that no reliance can be placed upon the white muscardine, but that the green and red varieties are quite effective. It is thought that the green muscardine is better adapted than the other varieties to the climatic and other conditions of the government of Kiev. The author summarizes the results of his extensive observations on this insect since 1892. It was observed that the beetles are most affected by the fungus when they occur in large masses in the soil. Numerous observations were made for the purpose of determining the depth to which larvæ penetrate. An examination of the soil to ascertain the number of dead and living larvæ and beetles indicates that the distribution of the muscardine and the intensity of its effect upon the beetles are in inverse proportions to the distances between the individual insects. The author recommends the preservation over winter in cellars of masses of soil containing large quantities of the muscardine. This material may then be scattered upon ground to be infested and may be plowed under. It is also recommended that in the fall the soil be plowed at a depth sufficient to expose the larvæ to the action of frost.

Cleonus punctiventris and muscardine, J. Danysz (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *2* (*1901*), *No. 4, pp. 464–482*).—This insect is said to have been injurious to sugar beets for the past 30 years. From the results of experiments with artificial insecticide methods it is believed that the insect can not be thus exterminated or even held sufficiently in check. Great hopes, however, are expressed for the ultimate beneficial effects of the use of white muscardine as a fungus disease for destroying the beetles.

Methods and results of field insecticide work against the San José scale, 1899–1902, S. A. FORBES (*Illinois Sta. Bul. 80, pp. 463–502, pls. 9*).—In this bulletin a report is made on extensive operations conducted in a practical manner and under ordinary conditions in exterminating San José scale in infested orchards. During the progress of this work 4 treatments were used in winter, viz, hydrocyanic-acid gas, whale-oil soap, kerosene emulsion, and lime-sulphur-salt wash. It was found that all of these methods were effective under favorable conditions. Fumigation with hydrocyanic-acid gas is believed to be practically restricted to comparatively small trees and quiet weather, while the California wash has a decided advantage in the persistence of its effectiveness. The 4 insecticides differ in convenience of application, and safety. Considerable injury was done to the peach, and in 1 case to an apple tree, by a kerosene emulsion of only 20 per cent. The total cost of preparation and application did not differ greatly for the 4 insecticides. The fumigation process is much more expensive with respect to cost of materials. From the standpoint of convenience of application the author prefers kerosene emulsion and California wash. As a result of the whole comparison of these 4 insecticides it is concluded that the best treatment for ordinary use against the San José scale consists in spraying in winter with the California wash.

The use of hydrocyanic-acid gas in greenhouses, G. C. BUTZ (*Pennsylvania Sta. Rpt. 1901, pp. 319–395*).—Experiments were made in fumigating greenhouses containing a considerable variety of plants. It is apparently possible to fumigate greenhouses successfully without injury to the plants, provided only 1 or 2 species of plants of about equal hardiness are kept in each house. In conservatories and greenhouses wi h a large assortment of plants the gas can not be used without injury to the more tender species. In the experiments reported in this paper fumigation was begun at about sundown, while the plants were dry, and the length of exposure in every case was 25 minutes. The insects which it was sought to destroy by these experiments were thrips, mealy bug, plant lice, scale insects, and red spider. In 2 greenhouses 0.15 gm. potassium cyanid per cubic foot of air space was employed, while in the third only 0.12 gm. was used. As a result of these experiments a considerable difference in the resisting power of different plants to hydrocyanic-acid gas was found. The various plants in the greenhouses are arranged in 3 categories according as they were uninjured, slightly injured, or totally killed. Ferns, grasses, mosses, begonias, etc., were uninjured; fuchias, geraniums, heliotropes, nasturtiums, palms, cacti, etc., had the tender leaves injured; while Pellea and *Tradescantia bicolor* were killed. Plant lice were all destroyed by the fumigation. Isolated mealy bugs were killed, but where they occurred in large masses the older individuals and the eggs were not destroyed. Scale insects were killed, except eggs under old scales. Red spiders were killed only to the extent of about 10 per cent.

The white fly or plant-house aleurodes, W. E. BRITTON (*Connecticut State Sta. Bul. 140, pp. 17, pls. 4, figs. 5*).—The white fly has been the most serious pest of tomatoes in forcing houses for the past 8 years. It also lives on outdoor plants in the garden throughout the summer. Notes are given on its relationship to other insects and on the nature of its injuries and its habits and life history. A detailed description is given of the insect in its various stages, chiefly based on the notes of Westwood. The insect is most injurious in forcing houses to tomato, cucumber, and melon plants, while florists complain of its injury to lantana, heliotrope, and ageratum. A list is given of the food plants upon which the author observed the insect in its nymph stage. A number of remedies have been tried in combating this insect. Fumigation with tobacco does not kill a large proportion of the insects. Fumigation with hydrocyanic-acid gas kills all of the white flies, but since the tomato is especially susceptible to the effects of this gas, more or less serious injury may be experienced from its use. Whale-oil soap in the proportion of 1 lb. to 5 gal. of water destroys the nymphs, but produces a disagreeable odor. Fir-tree oil at the rate of ½ lb. to 2 gal. of water gives excellent results, but is too expensive. A 15 per cent mechanical mixture of kerosene gives good results in killing the insects, but lends an unpleasant odor to the tomatoes. The best results were obtained from spraying tomato plants with common soap and water in the proportion of 1 lb. of soap to 8 gal. of water.

"Termes taprobanes"—white ants as a pest of trees (*Dept. Land Records and Agr., Central Provinces Bul. 6, 1902, pp. 3*).—Notes are presented on a number of experiments conducted for the purpose of determining effective and convenient remedies for destroying white ants. These experiments were duplicated in a number of different localities under different conditions. Tobacco decoction, kerosene, salt and soap, were among the remedies tried, but all of these gave unsatisfactory results. Excellent results were obtained from the use of Gondal fluid, containing 1 part gum of *Gardenia gummifera*, 2 parts asafetida, 1 part Bazar aloes, and 2 parts castor-oil cake. This fluid is to be applied in a continuous band around the trunks of trees which are to be protected against the attacks of the white ants.

On mites attacking beetles and moths, W. W. SMITH (*Trans. and Proc. New Zealand Inst., 35 (1901), pp. 199–201*).—Brief notes are given on *Uropoda vegetans*, which was observed as a parasite on 9 species of beetles and 2 species of moths. The beetles and moths which are parasitized by this mite have the habit of resting in moist places, and it is believed that the mite thus gains opportunity for attaching itself to its hosts.

The destruction of certain injurious insects, especially Hyponomeuta padella, J. LABORDE (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 20, pp. 1149–1151*).—Since hand picking of the caterpillars of Hyponomeuta and spraying with ordinary insecticides have been found slow or ineffective methods for destroying this insect, the author conducted a number of experiments for the purpose of developing a more efficient insecticide. The material used in these experiments contained 1,500 gm. pine resin, 200 gm. caustic soda, and 1 liter ammonia to 100 liters of water. It was found that this insecticide readily penetrated the silk threads which protected the larvæ and proved to be an efficient agent for destroying the latter. It appears to be valuable as an insecticide application up to the time of pupation of the insects.

The migratory locusts and means of combating them in our African colonies, L. SANDER (*Die Wanderheuschrecken und ihre Bekämpfung in unseren afrikanischen Kolonien. Berlin: Dietrich Reimer, 1902, pp. 544, figs. 40, maps 6*).—In this volume the author presents an elaborate account of extensive investigations made for the purpose of determining the distribution, habits, and means of combating the migratory locusts of the German colonies in Africa. A detailed historical account is presented on the various outbreaks which have occurred in East Africa, Southwest Africa, Cape Colony, Togo, and Kamerun. An account is given of the anatomy and development of locusts, together with descriptions of the different forms under which they appear. The migratory species which are most important in Southern Africa are *Pachytylus cinerascens*, *P. migratoroides*, *P. sulcicollis*, *Schistocerca peregrina*, and *S. paranensis*. An elaborate discussion is given of the following subjects: Migrations of locusts, causes and consequences of their migration, food plants natural conditions for the rapid multiplication of locusts, peculiarities of the habits of locusts in South Africa, natural enemies of locusts, the remedies which have been adopted for combating the locust, and various official regulations which have been adopted for destroying them. In the chapter on natural enemies of locusts mention is made of various birds, reptiles, insects, and other animals which prey upon or parasitize them, and an account is also given of the fungus and bacterial diseases which have been tested in destroying them. In a chapter on methods for combating locusts an elaborate account is presented of the various mechanical and chemical remedies with which experiments have been made.

The secondary adaptation of the front leg of Gryllotalpa vulgaris, C. Vaney and A. Conte (*Ann. Soc. Linn. Lyon, n. ser., 47 (1900), pp. 151–153, figs. 3*).—Brief notes on the changes which the digging feet of the mole cricket undergo during its development from the larval to the adult form.

A review of the North American species of Athysanus, H. Osborn and E. D. Ball (*Ohio Nat., 2 (1902), No. 6, pp. 231–256, pls. 2*).—The authors have excluded a number of species which had previously been referred to this genus and now admit 26 species, all of which are described, together with notes on their habitat.

The butterflies of the vicinity of New York City, W. Beutenmüller (*Jour. Amer. Mus. Nat. Hist., 2 (1902), No. 5, Sup. (Guide Leaflet No. 7), pp. 52, figs. 96*).—Brief notes are given on the occurrence and feeding habits of nearly 100 species of butterflies which occur within a radius of 50 miles from the city of New York.

A natural history of the British Lepidoptera, III, J. W. Tutt (*London: Swan, Sonnenschein & Co., 1902, pp. XII + 558*).—This volume continues the author's text-book on the subject of British Lepidoptera, and contains a detailed account of the Sphingidæ belonging to the group which the author names the *Sphingo-micropterygid stirps.* As in previous volumes, the synonomy of each species is given in great detail and extensive notes presented on the biology of the different species. The volume is furnished with numerous bibliographical notes and with a complete index.

Some plants which live upon and in insects, J. L. Sheldon (*Nebraska State Bd. Agr. Rpt. 1901, pp. 131–141, figs. 11*).—This paper is occupied with a discussion of bacteria and fungus diseases which have been found more or less useful in controlling insect pests.

The common spiders of the United States, J. H. Emerton (*Boston: Ginn & Co., 1902, pp. 225, figs. 501*).—The purpose of this volume is to present an account of the common species of spiders which will enable the ordinary observer to identify them and learn something of their habits and economic relations. The author discusses the anatomy and habits of spiders in general and gives a special account of a number of families of spiders, including Drassidæ, Dysderidæ, Thomisidæ, Attidæ, Lycosidæ, Agalenidæ, Therididæ, Linyphiadæ, Epeiridæ, and Ciniflonidæ.

A short description of the Culicidæ of India, with descriptions of new species of Anopheles, F. V. Theobald (*Proc. Roy. Soc. [London], 69 (1902), No. 456, pp. 367–394, pl. 1, figs. 2*).—In this report on the mosquitoes of India the author briefly describes the known species, together with a number of new ones, and presents a table for use in the identification of all species.

Observations on the larvæ of Anopheles and Culex in winter, B. Galli Valerio and G. Rochaz (*Centbl. Bakt. u. Par., 1. Abt., 32 (1902), No. 8–9, Orig., pp. 601–608*).—The authors repeatedly found recently hatched and older larvæ of mosquitoes in pools and swamps throughout the winter season. Experiments made in the laboratory on the resistance of eggs of Culex to various physical and mechanical agencies indicate a considerable degree of resistance to these agencies. It is believed, therefore, that the eggs of mosquitoes may hatch during the warm days of winter, even under dry conditions. Subjection of eggs for 22 hours to a temperature of 0 C. had no effect in preventing the subsequent hatching The same results were obtained from placing eggs on ice for 48 hours It was found that under laboratory conditions the eggs are readily hatched when barely moist or while quite dry.

Reports on plans for the extermination of mosquitoes on the north shore of Long Island between Hempstead Harbor and Cold Spring Harbor, W. T. Cox, H. C. Weeks, et al. (*New York: North Shore Improvement Association, 1902, pp. 125, figs. 8, map 1*).—In the present volume the report is made on a survey of the northern shore of Long Island for the purpose of locating the breeding grounds of mosquitoes and suggesting methods for destroying them. Popular notes are given on the habits and life history of mosquitoes by F. E. Lutz and C. B. Davenport. As the result of the survey of this region, recommendations are made concerning the methods of treatment of the various pools and bodies of stagnant water in which Culex and Anopheles were found to breed. It is believed by the authors that mosquitoes are not carried by their own flight or by the action of the wind to any great distance from their breeding ground. The north side of the island is thought, therefore, not to become infested by mosquitoes from the southern shore. A report was made by N. S. Shaler on the origin and present condition of the marshes and swamps of northern Long Island.

Notes on species of sand fly, W. R. Colledge (*Proc. Roy. Soc. Queensland, 17 (1902), No. 1, pp. 17–24, pls. 4*).—Detailed notes are given on the appearance, habits, and life history of a species of sand fly which is believed to be closely related to *Ceratopogon albopunctus.* The insect is described in its various stages and notes are given on the difference in the habits of the 2 sexes. Apparently only the females attack man and domesticated animals.

The horse bot fly, C. French and J. R. Weir (*Jour. Dept. Agr. Victoria, 1 (1902), No. 7, pp. 693–697, pl. 1*).—Notes are given on the habits and life history of *Gastrophilus equi.* Mention is made of the usual remedies adopted in preventing or curing infestation with the larvæ of this insect.

The influence of feeding cane sugar and starch sirup on the composition of honey, E. von Raumer (*Ztschr. Analyt. Chem., 41 (1902), No. 6, pp. 333–350*).—Experiments were conducted by the author for the purpose of determining the extent to which the ferment of the honey stomach of the bee acts as an inverting or hydrolyzing agent on cane sugar and dextrin. During the feeding experiments the total amount of carbohydrates fed to the bees amounted to 1,336 gm., while the total amount of honey collected was 1,769.92 gm. Of the 456 gm. of cane sugar fed to the bees only 16.9 gm. were found in the honey, while of the 532 gm. of dextrin which was fed, 249.98 gm. were recovered in the honey. It is considered quite a remarkable fact that so small a quantity of cane sugar remained uninverted, while in previous feeding experiments a much larger percentage had passed over into the honey.

The long-tongued bees (Apidæ) of California, C. Fowler (*California Sta. Rpt. 1899–1901, pt. 2, pp. 316–330*).—The author gives brief notes on the occurrence and distribution of the long-tongued bees of California. The notes are based largely on material which was collected near Berkeley in 1898. A number of new species were found in this collection and have been described elsewhere.

Studies on the organism of foul brood of bees, V. Lambotte (*Ann. Inst. Pasteur, 16 (1902), No. 9, pp. 694–707*).—The author conducted a series of experiments with material obtained from various infested colonies of bees in different localities. As the result of extensive bacteriological study it is concluded that the so-called *Bacillus alvei* is not a distinct species but is identical with *B. mesentericus vulgaris.* This organism is an exceedingly common species and forms spores in the manner which had already been observed in the bodies of bee larvæ affected with foul brood. Inoculation experiments with healthy bees demonstrated that all the symptoms of foul brood could be produced by pure cultures of *B. mesentericus vulgaris.* Upon making a comparison of cultures of organisms obtained from bees affected with foul brood and of authentic cultures of *B. mesentericus vulgaris*, the 2 organisms were found to agree in every respect.

Silks of the Far East and French colonies; silkworms and related species, H. J. de Cordemoy (*Les soies dans l'extrême Orient et dans les Colonies Françaises; les vers a soie et leurs similaires. Paris: Agustin Challamel, 1902, pp. 112, pl. 1*).—The author presents a general account of the silk industry and discusses the present conditions of this business in China, Japan, India, Indo-China, Madagascar, Western Africa, Algeria, and Tunis. In this discussion the author gives attention to a large number of species of insects from which silk has been produced. The species discussed belong to the genera Antherea, Attacus, Bombyx, Caligula, Saturnia, Sericaria, etc.

FOODS—NUTRITION.

The influence of preservatives upon the food value of milk, C. F. Doane and T. M. Price (*Maryland Sta. Bul. 86, pp. 64*).—Using the experimental methods described in a previous publication (E. S. R., 13, p. 674), the authors quote a number of experiments with calves in which the digestibility of milk with and without added preservatives was tested. The preservatives used were boric acid, borax, salicylic acid, and formaldehyde, the boric acid and the salicylic acid being added to the milk in the proportion of 1:1,000, the borax in the proportion of 1:675, and the formaldehyde 1:10,000, it being recognized that all these amounts are in excess of the quantities usually regarded as sufficient. The average results of the experiments, which extend over 2 years, follow:

Average digestibility by calves of milk with and without preservatives.

Kind of preservative.	Protein.	Fat.
	Per cent.	*Per cent.*
Salicylic acid (added just before feeding)	98.02	93.96
Boric acid (added just before feeding)	93.84	97.16
Formaldehyde (added just before feeding)	95.01	97.75
Boric acid (added 24 hours before feeding)	91.00	97.57
Borax (added 24 hours before feeding)	92.22	97.35
Formaldehyde (added 24 hours before feeding)	94.83	98.36
Salicylic acid (added 24 hours before feeding)	90.04	92.81
No preservative	93.52	97.37

From these figures it appears that on an average 1.31 per cent more protein and 0.99 per cent more fat were digested when the milk was preserved with formaldehyde than when no preservative was added. In the case of salicylic acid there was a difference of 3.48 per cent protein and 4.56 per cent fat in favor of the untreated milk. With borax and with boric acid the difference was also in favor of the untreated milk, being for the borax 1.3 per cent protein and 0.02 per cent fat, and for the boric acid 2.52 per cent protein and 0.19 per cent fat.

"In all of the series the comparative results were nearly the same and the results in the 2 seasons' work were so nearly the same that it would appear that the work was exhaustive and could be depended upon to represent fairly well the results that would be obtained if this same line of work was carried on indefinitely. The results obtained in our work are practically the same as obtained by other workers. Borax and boric acid in the experiments conducted by other men appeared to slightly prevent digestion, while formaldehyde had the opposite effect.

"From the results of this work many people may be inclined to think that milk preserved with formaldehyde is even to be preferred to milk treated with no preservative, as the tables evidently show it to be more digestible. . . . But it would be entirely possible for the preservative to render the milk more digestible and still have properties that would prove injurious. It is entirely possible for the preservative to unduly stimulate the digestive organs and in the course of time bring them to a diseased condition. For this reason it is impossible to say that formaldehyde, if injurious, is the least injurious of any of the preservatives used in the milk business. The fact that the other preservatives used made the milk less digestible is sufficient to condemn them. Adults could possibly drink such milk with impunity, but in the tenement districts of cities, where the babies have a hard struggle for existence, it takes a very little to turn the scale either in favor or against their chances for life."

The average gain in weight per calf during the 3-day periods in which milk with boric acid was fed was 0.5 lb., milk with salicylic acid 3 lbs., with formaldehyde 5 lbs., and milk with no preservative 1 lb.

"The calves fed for an extended period with milk preserved with boric acid and formaldehyde made very satisfactory gains in weight. The two receiving the boric acid lost a good share of their hair, presumably from the effects of the acid."

The effect of curdling with rennet upon the digestibility of milk, R. Popper (*Arch. Physiol. [Pflüger], 92 (1902), No. 10–12, pp. 605–614*).—Artificial digestion experiments showed that milk coagulated with rennet was somewhat less digestible than untreated milk, but the author believes that the difference is not as marked as has been claimed by some other investigators, since he found that there was a considerable range in the results of parallel experiments.

The digestibility of food consumed with varying quantities of water, S. Růžička (*Arch. Hyg., 45 (1902), No. 4, pp. 409–416*).—The author was himself the subject of experiments in which the digestibility of a mixed ration was determined when a fairly large quantity of water was consumed at intervals during the day and when practically the same amount was consumed immediately before, during, and after meals. In each case the amount of water consumed daily was practically the same, averaging nearly 1,480 gm. daily. The results obtained showed that the mixed diet was somewhat more thoroughly digested when the bulk of the water was taken near meal times. The author believes that the results are not numerous enough for general deductions, but that they do warrant the conclusion that a reasonable amount of fluid taken at meal times can not have any bad effect.

The digestibility of foods and condiments as shown by microscopical studies of the feces, F. Schilling (*Die Verdaulichkeit der Nahrungs- und Genussmittel auf Grund mikroskopischer Untersuchungen der Faeces. Leipzig: H. Hartung & Son, 1901, pp. 132, figs. 102*).—Believing that the digestibility of different materials can be most accurately determined by a microscopical examination of the undigested residues, the author describes methods and reports results of a large number of such investigations. Some of the general conclusions follow: All foods which are not soluble in water or rendered soluble by the digestive juices give larger or smaller amounts of undigested residue. An abundant vegetable diet hinders the digestibility of animal foods. There are no large undigested fragments from raw, finely chopped loin of beef. When it is eaten with black bread large muscle fibers are found in the feces together with rye hulls. Vegetable foods furnish the greater part of the feces. When a mixed diet is eaten isolated starch cells are always found in the feces and distended starch cells are regularly found, derived from the endosperm or the interior of cereals, potatoes, and legumes, even if these materials were finely ground or otherwise finely divided. The method of cooking, the mechanical condition of food, habit, and regularity in eating are of the greatest importance in the digestion of food and hence for the nutritive value of different materials under normal conditions. Undigested residue from a given diet is generally excreted on the second day after the food is eaten. Mechanical stimulation of peristaltic action is less important than thermic and chemical stimulation.

On the causes, variations, and significance of the color of the feces, L. A. Conner (*Med. News, New York, 81 (1902), No. 9, pp. 400–403; abs. in Jour. Amer. Chem. Soc., 24 (1902), No. 11, p. 500*).—The color of normal feces of adults on a mixed diet is a brown of varying degrees of darkness. This color, while due in large measure to the presence of modified bile pigment, is the result of a number of causes. The elements which go to make up the color may be grouped as follows: (1) Digestive secretions, (2) food residues, (3) discharges from the intestinal mucous membrane, and (4) accidental ingredients, such as drugs, etc.

Observations on vegetable proteolytic enzyms, with special reference to papain, L. B. Mendel (*Amer. Jour. Med. Sci., 124 (1902), pp. 310–318*).—The experiments which are reported on the character of the proteolytic action of papain led to the following conclusions: "While the products of the papain digestion of proteids resemble quite closely those of pepsin, so far as they have been examined in detail, the enzym differs from ordinary animal pepsin in that it acts readily in both neutral and alkaline media. On the other hand, although papain is comparable with trypsin in exerting a solvent action in fluids of various reactions, the failure to form leucin, tyrosin, or tryptophan in inappreciable quantities—at least under conditions in which they are readily formed in large quantities by the other tryptic enzyms—places it in a class of its own for the present."

A new method of measuring the effect of pepsin, E. I. Spriggs (*Ztschr. Physiol. Chem.*, *35* (*1902*), *No. 6*, *pp. 465–494*, *pls. 2*, *figs. 8*).—From experimental data which are reported, the author believes that a study of the viscosity of solutions treated with pepsin furnishes a means of judging of its effects. His conclusions follow: The viscosity of a solution of coagulable protein diminishes during the process of digestion. A similar effect is observed when hydrochloric acid is present without the pepsin, but it takes place much more slowly. If the change in viscosity during digestion is shown graphically as a curve, it will be seen that the change is at first rapid, then slower, and finally very small. When the viscosity remains constant the greater part of the coagulable protein is transformed into the uncoagulable form. Portions of the same protein solution treated with different quantities of pepsin contain like amounts of coagulable and uncoagulable protein when the viscosity is the same. The decrease in viscosity shown by curves can be explained mathematically, and furnishes a means of measuring the rapidity of digestion of different pepsin solutions.

The effect of different chemical bodies upon the activity of pancreas diastase ferment, P. Grützner (*Arch. Physiol.* [*Pflüger*], *91* (*1902*), *No. 3–4*, *pp. 195–207*, *figs. 3*).—The chemical bodies included in these experiments, which were conducted by M. Wachsmann, were halogen salts, alkalis and alkali salts, sulphates and other salts, inorganic and organic acids, alcohol, and chloroform.

Concerning the process of digestion in the small intestine, II, F. Kutscher and J. Seemann (*Ztschr. Physiol. Chem.*, *35* (*1902*), *No. 4–5*, *pp. 432–458*).—A study of the ferments of the small intestine.

Concerning the absorption of simple stereoisomeric sugars in the small intestine, J. Nagano (*Arch. Physiol.* [*Pflüger*], *90* (*1902*), *No 7–8*, *pp. 389–404*, *fig. 1*).—Using dogs with fistulas the author studied the absorption of 4 hexoses, i. e., d-glucose, d-galactose, d-mannose, and d-fructose, and 2 pentoses, i. e., l-xylose and l-arabinose. It was found that the stereoisomeric sugars had a different rate of absorption. Sugars with 5 carbon atoms were more slowly absorbed than those with 6 carbon atoms. When sugar solutions of like concentration were taken, the water absorption showed the same differences in rapidity as the sugars. The absorption of water diminished in proportion to concentration of a given sugar solution. In the upper part of the intestine, relatively speaking, sugar is more rapidly absorbed than water; in the lower part of the intestine the reverse is true.

On the lymphagogic action of the strawberry, and on post-mortem lymph flow, L. B. Mendel and D. R. Hooker (*Amer. Jour. Physiol.*, *7* (*1902*), *No. 4*, *pp. 380–386*).—In experiments made with a dog, an extract prepared from desiccated strawberries was injected intravenously. According to the author, this accelerates the flow of lymph richer in solids than is normally the case, and its action resembles that produced by other typical lymphagogues of Heidenhain's first class, viz those which produce their particular lymphagogic influence by stimulating the endothelial cells of the blood capillaries, and that the latter thus exert a secretory function which results in the formation of lymph. The effect of strawberry extract on the post-mortem flow of lymph was also studied.

Concerning the formation of sugar from protein, O. Loew (*Beitr. Chem.*

Physiol. u. Pathol. Ztschr. Biochem., 1 (1902), pp. 567–574; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 20, p. 973).—A theoretical discussion of the way in which sugar may be formed from protein in the body.

The formation of sugar from fat, O. Loewi (*Arch. Exper. Path. u. Pharmakol., 47 (1902), pp. 68–76; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 20, pp. 973, 974*).—According to the author, the experiment which he made with a dog did not supply any basis for the belief that sugar is formed from fat.

Note on the nature of the flour produced in the gradual reduction of wheat, F. B. Guthrie and G. W. Norris (*Agr. Gaz. New South Wales, 13 (1902), No. 9, pp. 936–939*).—Statistics are given of the amount of different milling products obtained from a number of varieties of wheat, and also of the percentage of flour, its strength and gluten content. According to the author, "the quantity of gluten obtained increases steadily with each successive break—that is to say, as the flour is obtained from the neighborhood of the bran. In the last break, in which the bran is scraped as close as possible, the flour is extraordinarily rich in gluten, and is derived entirely from the so-called aleurone layer, and it is just this layer that supplies the bulk of the gluten. This richness in gluten is, unfortunately, not accompanied with the other characteristics which go to make a good flour, and the flour from the last break is of little value on account of its low color."

Reports upon food and drug inspection for the year ending September 30, 1901, A. E. Leach (*Massachusetts State Bd. Health Rpt. 1901, pp. 59*).—Analyses of cocoa, lemon and vanilla extracts, milk, condensed milk, lime juice, and cider vinegar are reported; and methods are given for the estimation of milk sugar in milk, as well as rapid-routine methods for the detection of preservatives and for approximating the quality of milk, tables useful for the calculation of results being included. The latter methods, it is believed, are suited to the needs of milkmen. Of the 6,109 samples of milk examined, 28.4 per cent were found to be adulterated. The total number of foods other than milk examined was 3,120, and the percentage of adulteration was 18.9.

Second report on food products for 1901, B. W. Kilgore (*Bul. North Carolina State Bd. Agr., 23 (1902), No. 9, pp. 70, figs. 7*).—The results obtained in carrying out the provisions of the State pure-food law are summarized and discussed, and several special articles, which discuss methods of analyses and give results of examinations of food products, are reported, including Baking Powders, by W. M. Allen and F. C. Lamb; Tea, by C. D. Harris; Coffee, by C. D. Harris; Sugar, by W. M. Allen; Molasses, Sirups, and Honey, by J. M. Pickel, W. G. Haywood, and F. C. Lamb; Jellies, by W. M. Allen, W. G. Haywood, and F. C. Lamb; Jams, Fruit Butters, and Preserves, by W. M. Allen, W. G. Haywood, and F. C. Lamb; Vinegar, by W. M. Allen, and Condiments, by J. M. Pickel.

Adulteration of food (*Report, Returns, and Statistics of the Inland Revenues of the Dominion of Canada for 1902, pt. 3, pp. 133*).—In the reports of the official analysts of different districts and in the appendixes a number of analyses are reported of tea, milk, coffee, cocoa and chocolate, cheese, etc., most of which were made with the general purpose of detecting adulteration or sophistication. Bulletins No. 79 on Oil of Turpentine, No. 80 on Milk, and No. 81 on Fertilizers, are included in this report among the appendixes.

Dietaries for hospitals for the insane, W. O. Atwater (*New York State Lunacy Com. Rpt. 1900–1901, pp. 39–322*).—Continuing earlier work (E. S. R., 12, p. 877), the author reports the results of 16 dietary studies made in New York State institutions for the insane. The results are discussed with a view to improving the diet and making it more in accord with physiological standards. It was found that on an average the food actually eaten supplied 73 gm. protein and 2,305 calories of energy per person per day. The author's proposed dietary standard for inmates of institutions like those studied calls for 85 gm. of protein and 2,500 calories of energy per person per day, as the fact is recognized that the diet should be adequate to support the body without any danger of underfeeding. Valuable features of this article are tables showing the quantities of different food materials approximately equivalent in nutritive value to 100 pounds of a given material taken as a standard, and recipes for the preparation of a number of palatable and attractive dishes, some of which are comparatively inexpensive.

In Danish and Russian old-age homes, EDITH SELLERS (*Living Age* [*Littell*], 7. *ser., 17* (*1902*), *No. 3046, pp. 473–482*).—In this article, which is reprinted from *The Nineteenth Century and After*, the homes provided for aged people in Denmark and Russia are described. In the former country the homes are maintained at public expense; in the latter very largely by private funds. The diet, especially in relation to its cost, is treated of at some length as well as other special topics.

Recent contributions to the subject of the examination and valuation of commercial food alimentary pastes, A. JUCKENACK and R. SENDTNER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 5* (*1902*), *No. 21, pp. 997–1018*).—Methods of examining noodles and other similar pastes are described.

Cocoanut butter, P. POLLATSCHECK (*Chem. Rev. Fett u. Harz-Ind., 9* (*1902*), *pp. 4, 5, 28, 29; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5* (*1902*), *No. 22, pp. 1136, 1137*).—The manufacture and uses of cocoanut butter and similar products made from cocoanut oil are described.

Household economics, HELEN S. CAMPBELL (*New York and London: G. P. Putnam's Sons, 1902, pp. XXI + 286*).—This volume comprises a course of lectures delivered in the School of Economics of the University of Wisconsin. Chapters are included on the nutrition of the household, food and its preparation, cleaning and its processes, and household service, as well as upon subjects concerning the building and furnishing of the house, and related topics. In the appendix the author discusses the teaching of household economics and quotes material illustrating the way in which this subject or some of its branches has been taught at different institutions.

Practical cooking and serving, JANET McK. HILL (*New York: Doubleday, Page & Co., 1902, pp. XIX + 731, pls. 74, figs. 6*).—In addition to a large number of recipes for preparing various simple and elaborate dishes, the author discusses the functions and uses of food, marketing, garnishing and serving, and related topics.

Harper's cookbook encyclopædia (*New York: Harper & Bros., 1902, pp. 443, pl. 1*).—This volume, in which the subject-matter is arranged as in a dictionary, contains recipes and other material contributed by a number of different authors.

Foods and food control, W. D. BIGELOW (*U. S. Dept. Agr., Bureau of Chemistry Bul. 69, pts. 1, pp. 1–94; 2, pp. 95–188; 3, pp. 189–272; 4, pp. 273–372; 5, pp. 373–461*).—A compilation of the United States Federal and State laws regarding the manufacture and sale of foods and food products with special reference to adulteration and sophistication.

ANIMAL PRODUCTION.

Commercial feeding stuffs in Pennsylvania, W. FREAR (*Pennsylvania Sta. Rpt. 1901, pp. 28–109*).—The composition and feeding value of several different classes of feeding stuffs are discussed, in many cases the process of manufacture being described. A number of analyses of feeding stuffs are reported, including cotton-seed meal, linseed meal (old and new process), wheat (whole grain, bran, middlings, shorts, shipstuff, flour, and red dog flour), wheat feeds, rye, chop and middlings, malt sprouts, ground oats, oat feeds, corn, cracked corn, corn chop, corn-and-cob chop, gluten feeds and meals, germ oil cake, corn bran, sugar feeds, sugar-corn feeds, hominy chop, cerealine feeds, buckwheat flour and middlings, commercial breakfast food by-products, mixed feeds, poultry feeds, and condimental feeds.

Miscellaneous cattle food analyses, W. Frear (*Pennsylvania Sta. Rpt. 1901, pp. 110-116*).—In addition to the analyses reported above, the station has analyzed a number of feeding stuffs submitted by individuals, the analyses, it is stated, in a number of cases being incomplete. The feeding stuffs include cotton-seed meal, flaxseed meal, linseed meal (old and new process), wheat bran, wheat feed, corn meal, steam cooked corn-meal feed, gluten feed, corn bran, hominy feed, cerealine feeds, oat feed, buckwheat middlings, buckwheat feed, cocoanut meal, dried brewers' grains, dried distillery feed, sugar-beet feed, dog meal, meat scrap, cereal breakfast food by-products, and mixed feeds.

The by-products obtained in grinding wheat and rye, F. Otto (*Inaug. Diss., Göttingen, 1901; abs. in Centbl. Agr. Chem., 31 (1902), No. 9, pp. 606-610*).—A comparison was made of the German and imported rye and wheat, the composition of different varieties of these grains and their milling products being reported, as well as results of digestion experiments made with sheep.

The purchase of feeding stuffs (*Bd. Agr.* [*London*], *Leaflet 74, pp. 1-12*).—A popular discussion of the principles of nutrition and the different classes of feeding stuffs.

Report on molasses feeds, C. V. Garola (*Compt. Rend. Cong. Soc. Aliment. Rat. Bét., 6 (1902), pp. 1-15, dgms. 3*).—Mixtures of molasses with peat, peanut hulls, sesame and peanut hulls, and with straw were described and the favorable results obtained in feeding such mixtures to sheep and horses briefly noted. The rations containing the molasses mixtures were cheaper than those made of more common feeding stuffs.

The influence of lecithin on the development of the skeleton and nerve tissue, A. Desgrez and A. Zaky (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 20, pp. 1166-1168*).—From experiments with Guinea pigs, rabbits, and dogs the conclusion is drawn that feeding lecithin rendered the food more effective, especially in the formation of the skeleton and nervous system.

Study of the way in which lecithin acts in the animal body, A. Desgrez and A. Zaky (*Compt. Rend. Cong. Soc. Acad. Sci. Paris, 134 (1902), No. 25, pp. 1522, 1523*).—Experiments, which are briefly reported, made with guinea pigs led to the conclusion that the favorable effects which were observed to follow the feeding of lecithin were not due to glycero-phosphoric acid (the acid radical of lecithin), but to the basic portion. It was found that cholin and betain exercised a favorable effect, though in a less degree than lecithin, upon the formation of nitrogenous tissue and gains in weight.

Concerning the metabolism of growing dogs, E. Rost (*Arb. K. Gesundheitsamte, 18 (1901), No. 2, pp. 206-218, pl. 1*).—From experiments reported in detail the conclusion is drawn that the amount of nitrogen retained was greater than could be accounted for by the gain in body weight.

Methods of steer feeding, G. C. Watson and A. K. Risser (*Pennsylvania Sta. Rpt. 1901, pp. 211-222*).—The comparative merits of fattening steers in pens and stalls was studied in continuation of previous work (E. S. R., 12, p. 875), the State department of agriculture cooperating with the Pennsylvania Station. Of the 2 tests reported the first was made with 3 lots, lot 1 containing 10 animals and lots 2 and 3 containing 6 each. The steers in lot 1 occupied a box stall having a space equivalent to that of 10 ordinary stalls. Each of the animals in lots 2 and 3 was kept in a separate stall. Lots 1 and 2 were supplied with water by means of an automatic basin and lot 3 was watered daily in a yard, as it was desired to test the merits of different methods of watering as well as other points which have to do with the comparative amount of labor required to care for steers fattened under different conditions. All of the animals were fed a grain ration consisting of corn meal and wheat bran, 9:1, in addition to hay and corn stover. At the beginning of the test the average weight of the steers was not far from 950 lbs. each. During the 14 weeks of the trial the average daily gains per head in the 3 lots were 2.05 lbs., 2.18 lbs., and 1.89 lbs. The steers in lot 1 consumed per pound of gain 3.63 lbs. hay, 1.46 lbs. stover, and 8.39 lbs. grain. Similar values for lot 2 were 3.21, 0.94, and 7.82 lbs., and for lot 3 they were 3.47, 0.79, and 8.39 lbs., respectively. The time expended in the care of the 3 lots was 79.6, 148, and 155.5 hours, respectively, the values for lots 2 and 3 being recalculated on a basis of 10 animals per lot.

In a second test, made under practically the same conditions, with 3 lots of 2 steers each, the average weight of the animals at the beginning was about 890 lbs. and the average daily gain per steer in the different lots during the 57 days of the trial 2.71, 2.92, and 2.7 lbs., respectively. The hay eaten per pound of gain in the 3 lots was 4.44, 3.76, and 3.45 lbs., and the grain 5.91, 5.24, and 4.95 lbs., respectively.

According to the authors the results of this and their former work did not justify the claim that either of the methods tested was superior for fattening steers.

"Those animals that were furnished water by means of automatic watering basins consumed more coarse fodder, particularly stover, and ate their food with apparently greater relish, than did those that were turned out in a yard to water. The steers that were loose in a box stall or pen required less labor of attendance than those that were confined in stalls, even though both were supplied with water by means of automatic watering basins. The steers that were confined in a box stall required the same amount of bedding as those confined in stalls."

Cattle feeding with sugar beets, sugar, molasses, and sugar-beet residuum, L. S. Ware (*Philadelphia: Philadelphia Book Co., 1902, pp. XXIII + 389, figs. 21*).—In this volume the author has discussed the feeding value of sugar beets and sugar-beet products, the methods of pressing and drying beet pulp, the manufacture of molasses feeds, and related topics, quoting extensively from the literature of the subject and summarizing the results of American and foreign experiments. A detailed index adds to the value of the volume.

The business of breeding pure-bred stock, J. A. Craig (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 416–432*).—A general discussion of the subject of breeds and breeding, emphasizing its importance from a business standpoint.

Breeds of beef cattle and beef production in North Carolina, T. Butler (*Bul. North Carolina State Bd. Agr., 23 (1902), No. 7, pp. 53, figs. 39*).—The characteristics of different breeds of beef cattle are discussed, as well as such subjects as the formation of a herd, pastures, feeding and care, and related topics.

The cattle industry of the United States, J. Wilson (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 267–274*).—In this paper, which was read before a meeting of the Central Shorthorn Breeders' Association in Kansas City, the Secretary of Agriculture discusses the importance of the export cattle trade of the United States with special reference to Mexico and South America. The need of stringent laws regarding the inspection of cattle imported to this country is insisted upon, and the fact is pointed out that it is equally important to export only healthy cattle of superior quality if the enterprise is to be developed along the most satisfatory lines.

Cattle markets and abattoirs in Europe, H. E. Alvord (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 279–305, pls. 9, map 1*).—A descriptive and statistical article, dealing with the handling and slaughtering of live stock, inspection of meat, and related topics.

History of the farm-animal industry of Westphalia and methods of increasing it, J Kleinsorge (*Inaug. Diss., Univ. Jena, 1902, pp. 48, maps 2*).—A critical discussion of statistical and historical data.

The musk ox, G. F. Thompson (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 507–512, pls. 2, fig. 1*).—A descriptive article.

Some observations on sheep breeding from the experiment station flock records, W. L. Carlyle and T. F. McConnell (*Wisconsin Sta. Bul. 95, pp. 19*).—For

12 or more years the station has kept a record of sheep-breeding operations. For the first years this included only the ear-tag number of the service ram and ewes, the date of service, and the date of birth of the lambs. "The record was gradually perfected until during the past four years it included the number of lambs dropped and their sex, the weight and condition of lambs at birth, the apparent milking qualities of the ewes, and the weights of the ewes and the service rams used."

The general deductions drawn from the recorded data follow:

"From the breeding records of 514 ewes at this station we conclude that for such animals and conditions as ours the normal period of gestation ranges from 144 to 150 days after the date of service, and that more ewes will lamb 146 days after service than at any other time.

"There is no appreciable difference in the period of gestation for male and female offspring in sheep. There is an apparent relation between the duration of the period of gestation and the period required for reaching maturity. Quick-maturing breeds appear to carry their young for a shorter period than those breeds requiring more time to mature. Large lambs are on the average carried *in utero* for an appreciably longer period than small or medium lambs. Lambs dropped before the 144th and after the 149th day of pregnancy are lacking in strength and vitality at birth.

"Shropshire ewes were more prolific than any of the other breeds and crosses except the fourth cross of Shropshire rams on a Merino ewe foundation. From the data presented it is apparent that twins are the normal increase for ewes of the mutton type.

"One-year-old rams are not so prolific as those 2 or 3 years old. Ewes also average a larger percentege of increase in lambs after they reach full maturity at 3 years of age until after they are 6 years old, when the rate of increase diminishes. The amount of service required of the ram in breeding has an influence on the percentage increase in offspring of the ewes that produce lambs. Ewes bred early in the season of mating to a single ram dropped a larger percentage of lambs than those near the latter end of the season."

The maintenance ration of sheep, W. W. COOKE (*Pennsylvania Sta. Rpt. 1901, pp. 238-294*).—Cooperating with the State department of agriculture, a number of experiments were conducted to learn the amounts required by sheep for maintenance, on a ration of timothy hay alone, and of timothy hay and corn in the proportion of 2:1 and 1:2. The total weight of the feed in the 3 cases, which it was estimated would suffice for sheep weighing 50 kg., was 1.21 kg., 1.06 kg., and 0.94 kg., respectively. These values are based on a deduction from experiments with steers, that 11 lbs. digestible nutrients from corn is equivalent to 13 lbs. digestible nutrients from timothy hay. The estimated amounts proved to be very nearly correct. Sheep 1 and 2, each weighing not far from 50 kg. at the beginning of the trial, were fed the full amounts mentioned. Sheep 3, weighing not far from 30 kg., was fed 70 per cent of the amounts given the other sheep, as it was estimated that the surface area of this animal was 70 per cent of that of a sheep weighing 50 kg.

The feeding periods were of 10 days' duration. The sheep were kept in specially constructed crates, with devices for conveniently collecting the excreta. The food and excretory products were in every case weighed and analyzed. On an average the 3 rations were found to have the following coefficients of digestibility:

Average coefficients of digestibility—Experiments with sheep.

Ration.	Dry matter.	Organic matter.	Protein.	Non-nitrogeneous material.	Ash.	Energy.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Timothy hay alone	58.8	59.3	40.0	60.6	49.7	54.2
Timothy hay and corn, 2:1	65.5	66.3	46.5	68.1	43.9	61.4
Timothy hay and corn, 1:2	72.8	73.9	56.4	75.8	37.0	70.1

That the rations were practically sufficient for maintenance is shown by the small variation in live weight during the 79 days covered by the actual experimental and intervening periods and also by the figures for the gain or loss of nitrogen. These values have been summarized in the table which follows:

Average gain or loss of nitrogen and live weight.

	Sheep 1.	Sheep 2.	Sheep 3.
	Grams.	*Grams.*	*Grams.*
Average daily gain or loss of nitrogen	−0.17	+0.17	+0.07
Nitrogen in daily growth of wool	.64	.64	.48
Average daily gain or loss of nitrogen of flesh	− .81	.47	− .41
Average daily gain or loss of live weight	−1	+13	[illegible]

"The above figures show that if it is considered that there was no change in the average body fat of the animals during the test, the assumption [that the rations were sufficient] can not be far from the truth."

The author's summary of the digestible protein and non-nitrogenous material furnished by the rations which, as already stated, were considered as sufficient for maintenance follows:

Summary of maintenance rations.

	Sheep 1 and 2. Average weight, 46.4 kg.	Sheep 3.	
		Actual weight, 29.2 kg.	Calculated for weight of 46.4 kg.
Hay alone:	*Grams.*	*Grams.*	*Grams.*
Digestible protein	32.7	20.6	28.2
Digestible non-nitrogenous matter	479.8	385.8	556.8
Total digestible organic matter	502.5	406.4	585.0
Hay and corn (2:1):			
Digestible protein	34.5	23.6	32.3
Digestible non-nitrogenous matter	558.6	360	493.2
Total digestible organic matter	593.1	383.6	525.5
Hay and corn (1:2):			
Digestible protein	38.1	22.4	30.7
Digestible non-nitrogenous matter	535.7	334.4	458.1
Total digestible organic matter	573.8	358.8	488.8
Average:			
Digestible protein	35.1	22.2	30.4
Digestible non-nitrogenous matter	523.7	360.1	502.7
Total digestible organic matter	558.8	382.3	533.1
Nutritive ratio	1:15	1:16	1:16

From these figures the author concludes that a sheep requires for maintenance, per 50 kg. shorn weight, 37 gm. digestible protein and 538 gm. digestible nitrogen-free nutrients, the starch value of the ration being 596 gm. In discussing the maximum amount of protein required, he states that "when on hay alone, the 3 sheep received on the average 23.9 gm. of digestible protein. But it was not sufficient and the sheep drew on their bodies for 7.3 gm. more of protein, making the total needed by the body 31.2 gm. per day. When eating hay and one-third corn, they digested 32.4 gm. and had to call on their bodies for but 1.4 gm., a total of 33.8 gm. When given a liberal ration of hay and two-thirds corn, they found that 39.8 gm. of protein were more than they needed and they stored up 4.2 gm. in the body, leaving 35.6 gm. as the daily need of the system. These 3 sets of results are very close and while they show, as they ought to, that the animals were a little more sparing of protein when the supply was short than when it was abundant, they also show that sheep can thrive on but little more than half the protein than has been usually considered advisable."

Making corrections for gain or loss of flesh, it was computed that on an average the sheep required 2,009.8 calories for maintenance on a basis of 46.4 kg. live weight exclusive of wool, which is equivalent to 2,096 calories per 50 kg. shorn weight. The author assumes that on an average 10.3 gm. of wool is produced per day and on a basis of chemical composition calculates that this amount has an energy value of 20.55 calories.

"As the maintenance ration of a sheep is approximately 2,000 calories per head per day, it will be seen from the above figures how small a draft is made for the growth of the wool. This also helps to explain the fact, that has been observed, that when the ration is insufficient for maintenance the growth of wool is but slightly reduced."

The requirements of sheep in proportion to weight and surface area are discussed, and the conclusion reached that "in proportion to its body surface the sheep is more economical of its food than the steer."

Throughout the test the amount of water consumed was recorded and it was found that the average amount drank per sheep per day on a hay ration was 1.57 kg. On hay and corn, 2 : 1, it was 1.29 kg., and 1.11 kg. on a ration of hay and corn, 1 : 2.

In connection with the above experiments some tests were made to determine the amounts of nitrogen and carbon lost in drying feces, and the chemical bodies in which the loss occurs. On an average the feces from hay alone lost 6.6 per cent of the nitrogen originally present. Those from hay and one-third grain 7 per cent; and from hay and two-thirds grain 7.3 per cent. These differences are so slight and the differences between duplicates are so great as to indicate that the amount of loss is not dependent on the kind of feed nor on the individuality of the sheep. The losses are probably dependent on the bulk of the material and the temperature to which it is exposed.

In one case it was found that 0.571 per cent of the final dry matter was lost as carbon and 0.390 per cent as nitrogen. According to the author "the common acids produced by the action of the ferments of the digestive canal are acetic and butyric acids. In one case the proportions were two parts of acetic to one of butyric acid. In most cases the proportions of butyric acid were less. . . . It is probable that in air-drying, sheep feces lose 1 per cent of their heat value in the form of ammonium acetate in addition to ammonium carbonate and an additional, though small, quantity in skatol and other volatile organic compounds. In estimating the energy value of the rations eaten in the accompanying digestion experiments no allowance has been made for this heat value lost in drying. It would diminish the amount of energy calculated for the daily maintenance ration by about 10 calories or 0.02 of its value."

The results obtained with carbon are not regarded as final, but are given as a progress report.

The energy of the urine and the losses in drying it were also studied. In one case it was found that the loss of carbon amounted to 0.269 per cent and that of nitrogen to 0.224 per cent. On the basis of these figures and other data the author calculates the proportion of these elements lost as ammonium carbonate and as indol and skatol. From a consideration of the available data he concludes that "instead of sheep urine being a mere solution of urea and hippuric acid, in this case fully half the total carbon probably existed in non-nitrogenous compounds. Other tests of sheep urine from different feeds have given widely varying results, showing that there is no constant relation of the nitrogenous and non-nitrogenous constituents."

Determinations of the heat of combustion of sheep urine and a consideration of the probable composition of the dried residue led to the conclusion that in estimating the energy value of urine 32.3 calories should be allowed for each gram of nitrogen present in the fresh material.

A number of experiments were made in which the body of a sheep was inclosed in an air-tight box. The head protruded through an aperture, a loss of air being prevented by a large piece of rubber which fitted tightly around the neck and was attached to the box. Analyses of a current of air drawn through the box led the author to conclude that the amount of carbon dioxid excreted otherwise than in the respiratory products was very small, averaging about 0.02 of the total amount excreted per day from the lungs. Determinations of the methan in the ventilating current led to the deduction that "the amount of methan obtained as an excretion of the skin and intestines was small, amounting to about 2 gm. of methan per day."

Attempts to determine the amount of methan formed in the paunch were made with a sheep having a silver tube inserted in the trachea, through which gaseous products could be collected for analysis. The results obtained are not regarded by the author as satisfactory.

Lamb-feeding experiments, 1900–1902, B. C. Buffum and C. J. Griffith (*Colorado Sta. Bul. 75, pp. 36, pl. 1, figs. 5*).—Three tests with lambs are reported. In the first, which covered 84 days, 4 lots of 5 Mexican lambs averaging 55 lbs. each were used. All were fed alfalfa hay ad libitum, lots 1 and 2 receiving sugar-beet pulp in addition, and lots 3 and 4 sugar beets. All the lambs were fed some corn until they became accustomed to the beet ration, and during the last 8 weeks of the test a mixture of wheat and barley, 1:1, replaced the pulp or beets in the ration of lots 2 and 4. Lot 1 (beet pulp) gained 76 lbs., lot 2 (beet pulp and grain) 94 lbs., lot 3 (sugar beets) 106 lbs., and lot 4 (sugar beets and grain) 121 lbs. Lots 1 and 3 each gained 16 lbs. in fleece and lots 2 and 4 gained 17 lbs. The average cost of a pound of gain in the 4 lots was 2.83, 4.65, 4.16, and 4.87 cts., respectively. At the close of the test the lambs were slaughtered. The dressed weight of lots 1 and 2 was 45.7 and 48.1 per cent and of lots 3 and 4 it was 46.6 per cent of the live weight, respectively. The greatest profit, $3.40, was realized with lot 1 (beet pulp), the lowest, $2.17, with lot 2 (beet pulp and grain), the amounts for lots 3 and 4 being respectively $2.88 and $2.23.

Another lot of 5 Mexican lambs, which was fed a ration of beets and grain with straw instead of alfalfa, gained so little that it is not compared with the others and no values are reported.

The principal conclusions drawn from the test follow:

"Beet pulp is a valuable roughage to feed with alfalfa, and we believe would be especially valuable to use during the first part of a feeding period. Pulp-fed mutton had good flavor, but was not very fat.

"Beet pulp which does not cost the feeder more than $1.50 per ton at his yards, will give a return sufficiently large to pay for using it in a ration, but we would not recommend letting lambs eat so much of it during the finishing period that they will not consume good rations of hay and grain.

"Sugar beets did not prove to have a high feeding value for lambs. It is doubtful if farmers can afford to feed beets to lambs if they can sell them to a factory at $4.50 per ton, and the conditions must be favorable to make beets give a return sufficiently large to pay for raising them. Two pounds of sugar beets were equal to about one pound of pulp. Sugar beets and poor kinds of roughage can not be made to take the place of alfalfa hay."

The purpose of the second test was a comparison of home-grown grains with corn. Five lots of Mexican lambs, like those in the above test, were used, the lots being numbered 5 to 9, inclusive. They were all fed alfalfa hay ad libitum, and in addition lot 5 was fed corn, lot 6 spelt, lot 7 barley, lot 8 wheat and barley 1:1, and lot 9 wheat and spelt 1:1. With lots 5, 6, and 7 the feeding was continued for 90 days and with lots 8 and 9 for 95 days. The total gains in flesh in the 5 lots were 113, 127, 97, 117, and

87.5 lbs.,[a] the gains in fleece being 17, 15, 20, 14, and 14 lbs., respectively. The cost of a pound of gain in the 5 lots was 5.25, 4.28, 4.95, 4.68, and 5.93 cts., the alfalfa hay consumed per lb. of gain being 6.17, 6.26, 7.59, 6.50, and 8.20 lbs., and the grain 3.09, 3.03, 3.43, 3.38, and 4.28 lbs., respectively. The lambs were slaughtered at the close of the test, the dressed weight averaging 52.1, 49.2, 48.8, 49.6, and 59 per cent of the live weight, respectively. The profit ranged from 52 cts. in the case of lot 9 (wheat and spelt) to $3.04 in the case of lot 6 (spelt), the values for lots 5, 7, and 8 being $1.65, $2.02, and $2.30, respectively. According to the authors:

"These trials showed that at the same price corn had a feeding value greater than a mixture of wheat, barley, and oats, or wheat and barley, or barley alone.

"Our single trial with Russian spelt showed it to have a feeding value at least equal to corn, and greater than wheat and barley."

The relative merits of corn and home-grown grain were further tested with 4 lots of lambs. Lots 1, 2, and 4 contained 2 Shropshire crosses and 3 western lambs, and lot 3 contained 3 Shropshire crosses and 2 western lambs. All the lambs were fed alfalfa hay. In addition lots 1 and 2 were fed a mixture of equal parts of oats, wheat, and barley, and lots 3 and 4 corn. The drinking water given to lots 1 and 4 was cold and that given lots 2 and 3 was warm. At the beginning of the test the lambs in the 4 lots averaged respectively 75.5, 85.25, 83.75, and 84.25 lbs., the total gains in flesh during the 99 days of the trial being respectively 114, 91, 124, and 110 lbs., and the gains in fleece 28, 35, 32, and 34 lbs. The average cost of a pound of gain was 4.81, 5.24, 3.60, and 3.74 cts., the alfalfa hay eaten per lb. of gain 5.18, 4.84, 5.17, and 4.60 lbs., the grain 3.77, 4.27, 3.21, and 3.53 lbs., respectively. So far as could be observed warming the water had no marked effect on the quantity consumed, the amounts drunk by the 4 lots per lb. of gain averaging 14.64, 16.12, 14.17, and 13.82 lbs., respectively. The dressed weight was very nearly the same in lots 1, 3, and 4, averaging 63.4, 63.2, and 64.7 per cent of the live weight. In lot 2 it was somewhat less, averaging 61.2 per cent. The profits obtained with the lots fed mixed grains (lots 1 and 2) were $2.81 and $2.30, being much smaller than those obtained in the case of the lots fed corn (lots 3 and 4), which were $4.91 and $4.60. The authors calculate that 1 lb. of corn had a feeding value equal to 1.19 lbs. of the mixed grains used in this test. Regarding the other points studied the following conclusions are drawn:

"Shropshire grade lambs made much better gains than common western lambs when fed the same ration. Nine Shropshire grades made average gains of 43.6 lbs., and 7 native western lambs made an average of 31 lbs.

"Our trials with warm and cold water given to fattening lambs did not show any advantage of one over the other."

Feeding beet pulp to lambs, H. H. GRIFFIN (*Colorado Sta. Bul. 76, pp. 10*).—Using 2 lots of 125 lambs each, the value of beet pulp as a feeding stuff was tested. In the beginning of the test the lambs in lot 1 averaged 61 lbs. per head and those in lot 2 averaged 62 lbs. Both lots were fed the same quantity of alfalfa hay daily. In addition lot 1 was given corn, the amount finally fed being 9 oz. per head daily, and lot 2 beet pulp, the largest amount which could be satisfactorily fed being 6.5 lbs. per head daily. After 60 days the amount of beet pulp was diminished, as the supply was running low, and 6 and later 10 oz. of corn per head daily was added to the ration until the close of the test. During the 114 days covered by the trial the average gain per lamb in the 2 lots was 86.7 and 85 lbs., respectively. The total amount of alfalfa hay consumed by lot 1 was 23,165 lbs. and corn 11,245.5 lbs. The total amounts of alfalfa hay, beet pulp, and corn consumed by lot 2 were 59,444, 23,630, and 2,595.5 lbs., respectively. The amount of water consumed by the corn-fed lot was much greater than that consumed by the beet-pulp lot, the total amount in the 2 cases being 48,313 and 15,705 lbs. At the close of the test 2 lambs from each lot were sold to local butchers. The proportion of dressed meat was found to be about the same in both cases, according to the author, while the flesh of the corn-fed lot was regarded as superior in respect to color and the proportion of fat on the outside of the carcass. No other differences were observed in the character of the meat, it all being of good quality. The remainder of the lambs were sold in Kansas City, those fed corn bringing $3.71 per head and those fed beet pulp $3.64. The average loss in weight per head of the 2 lots during shipment was 9.4 and 9.2 lbs.

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[a] Estimated on the basis of 5 lambs.

In discussing the feeding value of pulp the author calculates that a ton is equivalent to 200 lbs. of corn.

"Owing to the bulky nature of the pulp not enough of it can be consumed by lambs to produce sufficient fat to finish them; hence it should be fed to the greatest extent at the commencement of feeding. What is fed in the latter part of the feeding period should be used as an appetizer and a regulator of the bowels rather than for the fat it produces. Pulp fed in large quantities produces a soft flesh.

"The matter of transportation is a very essential one for the farmer to consider in the utilization of pulp. For the profitable use the yards must be near the factory or to railway facilities. When large quantities of pulp are fed to animals confined in small lots the lots become very foul, much to the discomfort of the animals and loss to the feeder."

Lamb feeding in Colorado, L. CLARKE (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 275–278, pls. 2*).—Statistics are given regarding lamb raising in Colorado, an enterprise which the author believes may be greatly extended with profit, judging by the favorable results which have been obtained in the past.

Progress of the Angora goat industry in 1901, G. F. THOMPSON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 457–479, pls. 19, fig. 1*).—The author summarizes information received from a variety of sources regarding the number of goats kept, care of goats, their value for clearing land of brush, and related topics.

The Angora goat industry of Asia Minor, W. C. BAILEY (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 493–506, pls. 3*).—A number of goat raisers in Asia Minor were visited by the author, who describes their flocks, methods of caring for the goats, etc. Four animals, which seemed especially desirable, were procured for importation into the United States.

The economic feeding of plantation stock under the present conditions of high-priced grain, W. C. STUBBS (*Louisiana Planter, 28 (1902), No. 11, pp. 178–181*).—The feeding of farm animals is discussed with especial reference to local conditions. The successful use of molasses for farm animals, including horses and mules, is noted. According to the author, mules will eat with relish 8 to 12 lbs. of molasses per head daily, and this material is extensively fed to mules in Louisiana. The value of cotton-seed meal for horses and mules is also discussed. At the Louisiana stations 1 to 2 lbs. per mule per day have been fed with success. This should be gradually added to the ration, carefully mixed with other feeds, until the mules learn to relish it, and care should be taken that no uneaten residues ferment in the feed boxes. Six lbs. is regarded as the maximum quantity which can be safely fed, and this amount should be led up to gradually. Only bright yellow cotton-seed meal of a nutty, pleasant odor and taste should be used as a feeding stuff, according to the author, and all reddish and musty meal should be avoided.

Preparation of molasses feeds on the farm, A. GRÉGOIRE (*L'Ing. Agr. Gembloux, 12 (1902), No. 11, pp. 538–543, figs. 3*).—Domestic methods of preparing molasses feeding mixtures are described.

Molasses as food (*Amer. Vet. Rev., 26 (1902), No. 4, pp. 283–285*).—Brief notes on the successful use of molasses feeds for horses in France.

Maintenance and restoration of muscular energy by sugar, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 4 (1902), No. 33, pp. 206–209*).—The value of sugar as a source of muscular energy is discussed on the basis of experiments reported several years ago by V. Harley and U. Mosso.

Molasses for feeding animals; its use in feeding draft animals, L. Grandeau (*Jour. Agr. Prat., n. ser., 4 (1902), No. 44, pp. 567–569*).—The favorable results which have been obtained in feeding molasses to cattle used as beasts of burden and to horses were discussed. The author believes that molasses is a useful feeding stuff for draft animals.

Feeding molasses at domaine d'Arcy-en-Brie. Ration for horses and cattle, L. Grandeau (*Jour. Agr. Prat., n. ser., 4 (1902), No. 45, pp. 599, 600*).—An instance of the successful use of molasses in feeding horses and cattle is cited. The molasses ration for horses cost on an average 28 cts. The ration which is satisfactorily replaced cost 44 cts. In the case of cattle similar values were 26 cts. and 33 cts.

Molasses feeds and the feeding of horses, L. Grandeau (*Jour. Agr. Prat., n. ser., 4 (1902), No. 48, pp. 697, 698*).—The author discusses molasses feeds and notes the successful use of such a material, called "pain mélasse," in the feeding of horses belonging to one of the large Paris cab companies.

Molasses feeds and horse feeding. Experiments with peat molasses, L. Grandeau (*Jour. Agr. Prat., n. ser., 4 (1902), No. 50, pp. 760–764*).—Peat molasses is described and a test briefly reported in which this material was fed to horses with satisfactory results. Maize and chopped oat straw was also fed in addition to peat molasses, the amount of molasses consumed per day being over 1.5 kg. The daily work performed was equal to 387,000 kgm. The body weight was nearly maintained during the 11 months of the trial. The experience of some other investigators with this feeding stuff is quoted and discussed.

Molasses feeds in relation to horse feeding. Experiments with molasses-straw, L. Grandeau (*Jour. Agr. Prat., n. ser., 4 (1902), No. 51, pp. 793–795*).—An experiment is briefly reported in which a horse weighing 425 kg. was successfully fed a ration consisting of 4.133 kg. of molasses-straw and 3.117 kg. of maize, with a little salt, for some 4 months. Molasses-straw is prepared by drying a mixture consisting of 40 to 43 per cent chopped straw and 57 to 60 per cent molasses at 110°.

Practical guide for horse buyers, J. Pertus (*Guide pratique de l'acheteur de chevaux. Paris: B. Baillière & Sons, 1902, pp. 148, figs. 78*).—The various points of a horse which are regarded as of use to horse buyers are discussed, as well as French legislation on the subject and related topics.

The horse and different breeds of horses, F. A. and E. S. Zürn (*Das Pferd und seine Rassen. Leipzig: Hermann Seemann, 1902, pp. 229, pls. 17, figs. 67*).—In this volume, which is designed as a text-book, the authors discuss horse breeding and the principal breeds of horses found in the Orient and in western countries.

The question of temperament in raising army horses in the Prussian Provinces, O. Gagzow (*Inaug. Diss., Univ. Jena, 1902, pp. 90*).—The comparative merits of horses of lively and phlegmatic temperament are considered with special reference to the raising of army horses. The present condition of the horse industry in Germany is also taken up, much statistical and other information being given.

American breeds of fowls, T. F. McGrew (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 513–565, pls. 16, figs. 13*).—This description of the Plymouth Rock and Wyandotte breeds of fowls has been noted from other publications (E. S. R., 13, pp. 484, 777). The article is prefaced by a brief discussion of these breeds by D. E. Salmon.

Preservation of eggs (*Jour. Soc. Cent. Agr. Belg. 49 (1902), No. 11–12, p. 401*).—A brief note on E. Teisler's method of preserving eggs with fluo-silicic acid and its salts, marketed as an egg preservative under the name of Ovioval.

Turkey culture (*New York: Excelsior Wire & Poultry Supply Co., 1901, pp. 90, figs. 15*). In this publication a number of articles by different authors on breeds of turkeys, turkey management, marketing, diseases, and related topics are included.

The national standard squab book, E. C. Rice (*Boston, 1902, pp. 80, pl. 1, figs. 19*).—This book, which is based on the author's experience in squab raising, contains chapters on the feeding and care, killing and marketing squabs, pigeon diseases, and similar topics.

Profit in quail breeding (*Chicago: Pet Stock News, 1902, pp. 32*).—Directions are given for raising quail as pet stock or for market. The subjects discussed are taming wild quail, hatching, feeding and care, and related topics.

DAIRY FARMING—DAIRYING.

The dairy industry and dairy markets in Porto Rico, with notes on St. Thomas and Cuba, R. A. Pearson (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 306–397, pls. 35, figs. 6*).—This report upon the production and sale of dairy products in the islands of Porto Rico, St. Thomas, and Cuba, is based upon observations made by the author during 2 months spent in Porto Rico, and a shorter time in the other islands. The article is profusely illustrated and contains considerable statistical matter as regards the number of cattle in the islands and the imports of butter, cheese, and condensed milk.

The natural conditions of Porto Rico are considered as apparently favorable to dairying. Good dairy cows and improved methods are needed for the development of the industry. Among the topics considered in connection with dairying in Porto Rico are the value of land, water supply, cattle foods, origin and characteristics of native cattle, methods followed on dairy farms, and the milk, butter, and cheese produced. Analyses show that the native cows produce a good quality of milk. The yield, however, is small. Practically all the butter is imported. During the year 1900 this amounted to 307,469 lbs. The largest part of the butter, including the oleomargarine entered as butter, is from the United States, and is stated as occupying a low position in the markets of Porto Rico. The best quality of butter is that obtained from Denmark, the imports of which during 1900 amounted to 32,573 lbs. During 1900 the butter exported from the United States to Porto Rico was 26,825 lbs. and the oleomargarine 219,140 lbs. Analyses by G. E. Patrick of 92 samples of butter purchased in the three islands, but mostly in Porto Rico, are included, as are also analyses of 5 samples of cheese sold in Porto Rico. In discussing pasteurization as applicable to the handling of market milk in Porto Rico the author notes briefly experiments conducted at his request by C. F. Doane at the Maryland Station and H. Hayward at the Pennsylvania Station.

An account is given of experimental shipments of butter forwarded by this Department to Porto Rico for the purpose of ascertaining the character of the transportation facilities and the condition of the butter upon reaching its destination, and also to aid in forming an opinion as to the opportunity for developing a trade in dairy products. The butter shipped was made at creameries in Vermont, New York, Wisconsin, and Iowa, and was of the best quality. Details are given concerning the manufacture, composition, shipment, and sale of the butter. In summarizing the results many suggestions are made for the benefit of persons intending to make shipments in the future. "During most of the year, if not all, our best butter can be safely forwarded with present facilities of transportation, though these should be much improved. . . . Porto Rico offers only a limited market for butter, of which but a small portion may be of best grades. A very few creameries could easily supply the market for good butter. But the demand for both the better and the cheaper grades will certainly increase when they become well known and are offered at reasonable prices."

The amount of cheese imported into Porto Rico during 1900 was 710,956 lbs. Several cheeses were shipped experimentally by the Department.

The dairy conditions in St. Thomas and Cuba are more briefly described.

Investigations of methods of milking, F. W. WOLL (*Wisconsin Sta. Bul. 96, pp. 9, figs. 18*).—Considerable importance is attached by the author to the method of milking originated by Hegelund, previously noted (E. S. R., 14, p. 286). In the introduction to the bulletin the method is described and the manipulations are illustrated. The physiology of milk secretion is also considered. Extensive tests of the method made with a number of dairy herds are reported in detail and discussed. The author's summary of the results is quoted below in full:

"(1) The milking experiments conducted by the writer were made partly with cows in our university herd, partly with cows in 12 different Wisconsin dairy herds. The aim in all cases was to ascertain the gain in the production of milk and butter fat obtained by a system of manipulations of the udder after the regular milking was finished (Hegelund method); where the regular milker did not milk clean, the gain obtained by clean milking, together with manipulation of the udder, was ascertained. The plan of the experiments was therefore such as to show the character of the work done by the different milkers.

"(2) In our university herd the average daily production of milk from 24 cows was increased by 4.5 per cent by means of the manipulation method and the production of fat was increased by 9.2 per cent (range 3 to 30.2 per cent for individual cows), as the result of a milking experiment continued for 4 weeks; the average gain in milk being 1 lb. and in fat 0.09 lb. per head per day.

"(3) A similar average increase in production was obtained for the 12 dairy herds tested, viz, a gain of 1.08 lbs. in the daily production of milk per cow and 0.1 lb. of fat. The results obtained in this investigation, extending over a period of 4 months, with cows in all stages of lactation, indicate that this gain is maintained through the whole period of lactation. An increase in the daily production of butter fat per cow of one-tenth of a pound, for the million cows in the State would mean an annual gain of 30,000,000 lbs. of butter fat if the cows give milk 300 days in the year; the value of this increase to the dairy industry of the State would be about $6,000,000, on basis of a valuation of 20 cts. a pound for butter fat, a figure considerably below average Elgin prices.

"(4) The largest amount of milk obtained from a cow by the manipulation method, after the regular milking was done, was 5.5 lbs. per day and the lowest, 0.20 lb. The corresponding figures for fat production was 0.64 and 0.02 lb. The former figure is considerably above the average total daily production of cows in this or other States.

"(5) The greater portions of the gains obtained came through lack of care on part of the regular milker as the cows were not milked perfectly clean. But even in herds where the milkers did their work well, there were always one or more cows which gave an increase of nearly a pound of milk and one-tenth of a pound of butter fat by the manipulation method.

"(6) The milk obtained by the manipulation method is similar in composition to that of "strippings;" on the average for all herds it contained 10.32 per cent fat and was found to be about 2½ times richer than the ordinary milk. The highest per cent of fat found in the after-milking from any one cow was 23 per cent and from any herd, 14.41 per cent.

"(7) The difference in the work done by different milkers is brought out strongly by the results of the work done. In several cases one milker did his work so much better than the others in the same herd as to be worth nearly $10 a month more to the owner, on account of the larger yields of milk and fat which he obtained from the cows milked by him.

"(8) The results obtained in this investigation suggest that a thorough system of milking is a foundation requirement in successful dairying. For, aside from directly increasing the production of milk and fat from the cows, exhaustive milking will be likely to maintain a maximum flow of milk throughout the lactation period and to permanently develop the dairy qualities of both the dam and her offspring."

Report on the use of molasses in the feeding of animals, L. Nicolas (*Compt. Rend. Cong. Soc. Aliment. Rat. Bét., 6 (1902), pp. 16–25*).—In experiments with 10 cows lasting 2 months the substitution of molasses for concentrated feeds was unfavorable as regards the yield and quality of the milk produced. In further experiments the addition of phosphoric acid to the molasses feed appeared to exercise a very marked influence in increasing the production of milk and butter.

A milk unusually rich in solids, M. H. Pingree (*Pennsylvania Sta. Rpt. 1901, pp. 192–194*).—The milk of a healthy, four-year-old, high-grade Guernsey cow during the fourth and fifth months of her second lactation period showed an average fat content of 5.8 per cent. A sample of the milk taken a few days later showed the following composition: Moisture 82.99, total solids 17.01, fat 6.40, casein and albumin 4.37, lactose 5.25, ash 0.99 per cent, specific gravity at 60° F. 1.0372. One month later the composition was as follows: Moisture 84.28, total solids 15.72, fat 5.90, casein and albumin 3.80, lactose 5.34, ash 0.72 per cent, specific gravity at 60° F. 1.035. The daily yield when the 2 samples were taken was, respectively, 12 and 14.3 lbs. The relative proportion of the different constituents indicated that the milk was normal.

Composition of milk in the north of England, S. H. Collins (*Jour. Soc. Chem. Ind., 21 (1902), No. 24, pp. 1512, 1513*).—Average analyses of the milk of 18 cows in October showed a fat content of 3.55 per cent for morning's milk and 4.99 for evening's milk. The corresponding figures for solids-not-fat were 8.67 and 8.38 per cent.

Milk at Copenhagen, H. de Rothschild (*Le lait à Copenhague. Paris: O. Doin, 1903, pp. 36, pls. 12*).—A descriptive account of the two principal dairies in Copenhagen, one supplying the city with fresh milk preserved by means of ice and the other with pasteurized milk.

A new bacterium of soapy milk (Bacterium sapolacticum), W. Eichholz (*Centbl. Bakt. u. Par., 2. Abt., 9 (1902), No. 17–18, pp. 631–633*).—The morphological and cultural characteristics of a micro-organism isolated from a sample of milk having a decided soapy taste are reported. The organism, to which the name *Bacterium sapolacticum* is given, produced the same disagreeable taste when inoculated into sterile milk.

A study of some California butters made for export, M. E. Jaffa (*California Sta. Rpt. 1899–1901, pt. 2, pp. 231–234*).—The quality of the butter produced by a dairy herd fed a ration consisting of 60 lbs. of beet pulp silage, 10 lbs. of mixed hay, and 5 lbs. of mixed feed was investigated. Detailed data are given in tabular form as regards the composition and digestibility of the feeding stuffs, the manufacture of the butter, and the composition of the butter made each day for 6 days during August. Analyses were also made of the butter fat. The average composition of the butter was as follows: Water 10.60, fat 86.32, curd etc., 1.27, salt 1.64, and other mineral matter 0.17 per cent. The butter fat contained 6.39 per cent of butyrin; 55.68 per cent of palmitin, stearin, etc.; and 37.93 per cent of olein, and had a melting point of 32.7° C. and a refractive index at 25° C. of 1.4598. These figures are compared with analyses made elsewhere, and the tentative conclusion is drawn that beet-pulp silage fed in large quantities to cows has a tendency to produce soft butter.

Investigations on the composition and properties of butter fat from the milk of individual cows, P. Behrend and H. Wolfs (*Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 15, pp. 689–719*).—Determinations are given of the melting point and the refractometer, Reichert-Meissl, Hübl, Köttstorfer, and Hehner numbers of the butter fat obtained separately from the milk of 10 cows, and the relation of the different values is discussed. An increase in the melting point was associated with a decrease in the Reichert-Meissl number and an increase in the Hehner number. As the refractometer number increased the Reichert-Meissl and Köttstorfer numbers decreased and the Hübl and Hehner numbers increased. An increase in the Reichert-Meissl number was accompanied by a decrease in the Hübl and Hehner numbers and an increase in the Köttstorfer number.

The nonsaponifiable substance in butter fat, A. KIRSTEN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 18, pp. 833–856*).—This consists for the most part of cholesterol. Phytosterol, lecithin, and a yellow coloring matter are present to a small extent. Numerous determinations of crude cholesterol were made by the Böhmer method, which is described. In the butter fat from cows 10 to 13 years old, in different stages of lactation, the content of cholesterol averaged 0.46 per cent. In the fat from cows 6 to 7 years old the content was 0.38 per cent and in the fat from cows 4 years old the content was 0.42 per cent. Cows during the first lactation period showed an average content of 0.39 per cent of cholesterol. At the beginning, middle, and end of lactation the percentages of cholesterol were, respectively, 0.375, 0.44, and 0.50. The stage of lactation had apparently some slight influence upon the cholesterol content.

Constituents of Emmenthaler cheese, E. WINTERSTEIN and J. THÖNY (*Ztschr. Physiol. Chem., 36 (1902), No. 1, pp. 28–38*).—In studying the decomposition products formed in Emmenthaler cheese during the process of ripening the authors identified histidin, lysin, pentamethylenediamin, and tetramethylenediamin, and probably guanidin. Tyrosin was found in very old cheese.

VETERINARY SCIENCE AND PRACTICE.

The bactericidal action of blood serum and blood plasma, A. PETTERSSON (*Arch. Hyg., 43 (1902), No. 1, pp. 49–83*).—An extensive series of experiments was conducted by the author for the purpose of determining the power of blood serum and blood plasma of different experimental animals in destroying bacteria. The serum and plasma used in these experiments came from cattle, rabbits, guinea pigs, dogs, sheep, and cats. Detailed notes are given on the processes employed in obtaining the serum and plasma, and on the behavior of these substances as obtained from different animals. During the author's experiments it was found that the plasma of the circulating blood contains substances which destroy bacteria (alexin). After the blood is removed from the body its bactericide action may be either increased or diminished. The quantity of alexin may be increased by alexin which is derived from the leucocytes. The amount of alexin in the serum may be diminished by absorption into the fibrin. The action of the alexin may be weakened by the appearance of the better nutritive condition of the animal, since under such circumstances nutritive substances may be derived from the blood corpuscles. In some species of animals the alexin obtained from leucocytes outside of the animal body is so small in quantity that the bactericide action of the serum is slighter than that of the plasma. In other species of animals, on the other hand, so large a quantity of alexin is derived from the leucocytes after the blood is removed from the body that the bactericide action of the serum is considerably increased.

The antibodies of the blood serum in animals treated with blastomycetes, F. SANFELICE (*Centbl. Bakt. u. Par., 1. Abt., 32 (1902), No. 5, Orig., pp. 360–365*).—The experiments reported in this paper were made on 4 dogs which had been immunized against *Saccharomyces neoformans* and a pathogenic blastomycete isolated by Plimmer. The results of the author's observations may be stated as follows: In the blood serum of animals which have been immunized against the pathogenic blastomycetes by repeated injections of the same species of blastomycete attenuated by exposure to heat, antibodies or sensibilizing substances were found. These bodies are not to be found in the blood serum of animals infected with blastomycetes.

The mutual reaction between successive processes of immunization in the animal organism, L. VERNEY (*Centbl. Bakt. u. Par., 1. Abt., 32 (1902), Nos. 4, Orig., pp. 290–307; 5, pp. 366–376*).—During the author's extensive experiments with guinea pigs and rabbits it was found that an animal could be immunized against one pathogenic organism and could then be immunized against another organism without losing its immunity toward the first species. It was found that a partial immunity produced by one inoculation could be considerably increased by subsequent inoculations. In one experimental animal a marked agglutinating power was gradually developed against 3 micro-organisms, the typhoid bacillus, *Bacterium coli commune*, and the pyocyaneus organism.

Immunization experiments with Kraus' bacillus of rabbit influenza, E. Jacobitz (*Centbl. Bakt. u. Par., 1. Abt., 32 (1902), No. 4, Orig., pp. 288, 289*).—An outbreak of influenza occurred among the rabbits in the laboratory in which the author was working. Attempts were made to check the disease by different methods of immunization. Rabbits were first treated with killed cultures, the experimental animals receiving gradually larger doses of this material. The effect of the treatment was nil, and no trace of immunity was to be observed. An attempt was also made to protect rabbits against disease by increasing doses of living bacilli in very dilute solutions. The results of these experiments were also negative. All attempts on the part of the author to produce artificial immunization indicate that this result is impossible.

The effect of glycerin on virus, V. Galtier (*Jour. Méd. Vét. et Zootech., 5. ser., 6 (1902), Feb., pp. 65–71*).—Since glycerin is used so extensively in the preservation of virus of different sorts, the author undertook experiments to determine the length of time during which virus could be preserved in this reagent without losing its virulence. The experiments included tests with anthrax, glanders, and tubercle bacilli. It was found that fresh anthrax virus prepared from the pulp of affected organs rapidly lost its virulence when preserved in pure glycerin. At the end of 55 hours such material was attenuated to such an extent that it no longer produced infection in guinea pigs or rabbits, even when inoculated in large doses. When affected kidneys and spleens were preserved entire or in large pieces without trituration in pure glycerin the virulence of the bacillus was attenuated much more slowly. During the experiments it was found that anthrax virus containing spores, as compared with non-spore-bearing anthrax bacilli, resisted the action of glycerin much longer. The virulence of glanderous material was retained in glycerin for a period of 10 to 12 days, or in some instances 17 or 18 days. It is believed, therefore, that glanderous and tuberculous material or tissues suspected of being infected with these diseases may be safely preserved for a few days in glycerin, until opportunity is had for a bacteriological or inoculation test.

Aseptic metallic powder, L. Hoffmann (*Berlin. Thierärztl. Wchnschr., 1902, Nos. 1, pp. 1–4; 7, pp. 109, 110*).—The author conducted a number of experiments with 2 kinds of powder obtained from the establishment of a metal beater. It was learned by inquiry that these finely granulated powders, one of which was silver and the other golden in color, exercised no injurious effects upon the skin of man or animal. Experiments were therefore instituted for the purpose of testing the value of these powders in the treatment of wounds. During these experiments quite satisfactory results were obtained. It was found that the wounds could be directly covered with either of the powders, and that little subsequent dressing or treatment was required.

The action of aseptic metallic powders, Schmidt (*Berlin. Thierärztl. Wchnschr., 1902, No. 3, p. 39*).—The author takes issue with Hoffmann concerning the action of metallic powder on wounds. Hoffmann believed that the powders exercised merely a mechanical effect upon the wounds, preventing an infection from the outside, while the present author maintains that the aseptic action of metallic powders must be ascribed partly to their chemical properties as well as to their physical properties.

The therapeutic application of formaldehyde in a fixed form, F. Glage (*Deut. Thierärztl. Wchnschr., 10 (1902), No. 14, pp. 133, 134*).—The author found that the colostral milk of cows when treated with formaldehyde formed a uniform firm mass. This reaction was made use of in producing an antiseptic salve in a convenient and cheap form. The author found that by adding formaldehyde to colostral milk, a firm and effective antiseptic salve could be produced and good results were obtained from its use in the treatment of wounds.

Tuberculosis of animals in some of its relations to human tuberculosis, D. E. Salmon (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 257–266*).—Notes are given on the prevalence of tuberculosis in various parts of the United States as shown by statistics obtained from tuberculin tests. These tests have been reported in sufficient numbers to form a fairly reliable basis as to the percentage of tuberculous animals. Special attention is given to a discussion of the presence of this disease in dairy herds and hogs. During recent years tuberculosis has increased in extent in cattle and hogs in this and other countries. The author believes, therefore, that great care should be exercised in keeping the human food supply as free as possible from contamination with the tubercle bacillus. On account of the large number of tuberculous beef animals which are slaughtered and the relatively larger number of tuberculous cows the milk of which is used as food, special precaution in this direction is believed to be highly desirable. Notes are given on a number of cases related in the literature of this subject concerning apparent transmission of tuberculosis from animals to man.

Virulence of the bovine tuberculosis bacillus for monkeys and the effect of tuberculins made from tuberculosis bacilli derived from different animals, E. A. de Schweinitz and E. C. Schroeder (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 579–582*).—An African baboon inoculated with 1 cc. of a bovine tubercle culture died of generalized tuberculosis. An American ring-tail monkey was fatally infected from an injection of $\frac{1}{2}$ cc. of the same culture. Comparative tests were made of bovine and human tubercle cultures on baboons and rhesus. In every case the animals died of generalized tuberculosis. The authors report a number of observations which indicate that tuberculous animals respond to tuberculin test without regard to the source of the cultures from which the tuberculin is made. The experiments as a whole are believed to indicate the great virulence of bovine tubercle bacilli for man.

Composition of tubercle bacilli derived from various animals, E. A. de Schweinitz and M. Dorset (*Centbl. Bakt. u. Par., 1. Abt., 32 (1902), No. 3, Orig., pp. 186–192*).—A report is made on the investigations of the authors with regard to the composition of tubercle bacilli. The material upon which these investigations were made consisted of attenuated bacilli of human origin, virulent bacilli of human origin, virulent bacilli from cattle, hogs, horses, and birds. During the authors' investigations it was found that the highest percentage of ether extract was obtained from the attenuated bacilli of human origin, the other bacilli being arranged in this regard in the following order: Bacilli from the horse, virulent human bacilli, and bacilli from cattle, birds, and hogs. The results obtained indicate clearly that there is a difference in the composition of tubercle bacilli from different sources, perhaps equally as great as the difference in morphology. It appears also that there is a relationship between tubercle bacilli from different sources and that the degree of virulence may be connected with quite remarkable differences in composition.

Note on branched forms of tubercle bacilli found in cultures, M. Dorset (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 572, 573, fig. 1*).—A brief account is given of a number of branched forms of tubercle bacilli, and these are arranged in the order which is believed to represent the sequence in the process of branching. A species of streptothrix was found in the same culture and the attempt has been made to determine what influence the presence of this organism had upon the branching of the tubercle bacillus.

Agglutination of the tubercle bacilli and treatment of tuberculosis with the new tuberculin of Koch (bacterial emulsion), F. Thellung (*Centbl. Bakt.*

u. Par., 1. Abt., 32 (1902), No. 1, Orig., pp. 28–48).—The literature relating to the value of the agglutination test in the diagnosis of tuberculosis is critically reviewed. The author's experiments were made on healthy and infected guinea pigs and rabbits. Extensive series of experiments were conducted in 2 ways. In one series, the animals were infected with virulent tubercle bacilli and then treated with new tuberculin; while in the second series the experimental animals were first treated with new tuberculin, and subsequently infected with virulent tubercle bacilli. Further experiments were made on healthy guinea pigs, during which the animals were inoculated with ground or emulsified bacteria for the purpose of testing the effect of these preparations on healthy animals. The results of these experiments are presented in detail, but the essential points may be stated as follows: The agglutination of tubercle bacilli does not occur regularly in cases of tuberculosis. This reaction, therefore, can not be considered at the present time as a practical means of diagnosis. The tubercle bacilli may be agglutinated as a result of subcutaneous injection of Koch's bacterial emulsion in doses of a few milligrams. No favorable action of the new tuberculin of Koch upon the course of experimental tuberculosis could be observed. It was found that pulverized tubercle bacilli as well as the new tuberculin of Koch, or bacterial emulsion, might contain active virulent tubercle bacilli.

Causes and suggestions for the prevention of tuberculosis, H. D. HOLTON (*Sanitarian, 49 (1902), No. 394, pp. 193–203*).—A general discussion of the means of transmission of tuberculosis among human beings. It is argued that the danger from the meat and milk of tuberculous animals may have been somewhat exaggerated, but, in the author's opinion, such danger does exist to a considerable degree, and it is believed, therefore, that the safeguards which have thus far been adopted in preventing transmission of tuberculosis by meat and milk should not be abandoned.

Tuberculosis of the udder, A. MOSER (*Arch. Wiss. u. Prakt. Thierh., 28 (1902), No. 1–2, pp. 1–27, figs. 11*).—A review of the literature concerning the histology of mammary tuberculosis is presented, in connection with a bibliography of 33 titles. The author found that in mammary tuberculosis in cows the formation of new tissue begun in all cases with the proliferation of the secretory epithelium. This tissue was subsequently replaced by cells which arose from wandering cells. While the greater part of the tuberculous neomorph was found to consist of hardened lobules of the glands, the cooperation of the interacinous connective tissue was of less importance. The newly formed tissue undergoes necrosis, caseation, and calcification, in the order named.

Tuberculosis in the nerve centers in dogs, G. PETIT (*Rec. Méd. Vét., Paris, 8. ser., 9 (1902), No. 6, pp. 165, 166*).—Brief notes are given on the occurrence of tubercular meningitis, and other forms of tuberculosis in the central nervous system of dogs.

Foot-and-mouth disease, E. THIERRY (*Jour. Agr. Prat., n. ser., 3 (1902), No. 23, pp. 735–739, pl. 1*).—A general description is given of the symptoms of the disease, post-mortem findings, and of the treatments usually applied in combating this plague.

Foot-and-mouth disease of cattle and its treatment according to the method of Baccelli, H. MIESSNER (*Deut. Med. Wchnschr., 28 (1902), No. 10, pp. 176, 177*).—The author gives a brief review of the literature thus far published on the subject of intravenous inoculation of corrosive sublimate in the treatment of foot-and-mouth disease. The experiments of the majority of investigators, as well as those of the author, indicate that little success is to be hoped for from the use of this method.

A study of the central nervous system in cases of the foot-and-mouth disease of cattle, G. SCAGLIOSI (*Deut. Med. Wchnschr., 28 (1902), No. 12, pp. 197–199*).—Pieces of the brain and spinal cord from cattle affected with foot-and-mouth disease were carefully fixed and preserved for microscopic study. It was found that the nerve cells underwent profound alterations as a result of infection by the disease, and these changes in the central nervous system may be utilized in diagnosing the disease and in determining whether affected animals have recovered to such an extent as to render the meat safe for human consumption. The more important changes in the nervous system were found in the ganglion cells. Nissl's corpuscles became disintegrated, and the whole nerve cell exhibited a tendency to become homogeneous and later to form vacuoles in their substance. The changes in the ganglion cells of the brain and spinal cord were essentially the same.

Anthrax and blackleg, L. C. Tiffany (*Illinois State Bd. Live Stock Com. Bul. No 3 (ser. 1901–2), pp. 8*).—A brief popular discussion of the symptoms, cause, transmission, and prevention of anthrax and blackleg.

Anomalous forms of anthrax bacillus isolated from the blood of a bull dead of this disease, J. Lignières and H. Durrieu (*Rec. Méd. Vét., Paris, 8. ser., 9 (1902), No. 4, pp. 102–107, figs. 4*).—Cultures of anthrax bacillus taken from the blood of a bull which had died of natural infection with anthrax were made on various nutrient media, including peptone bouillon, gelatin, gelose, and milk. Great variation in the form of the organisms thus obtained was observed. Inoculation experiments on guinea pigs, rabbits, and sheep demonstrated that all these different forms of the anthrax bacillus were equally virulent.

Toxic paralysis of a carbunculous (anthrax) nature, A. Sclavo (*Centbl. Bakt. u. Par., 1. Abt., 32 (1902), No. 3, Orig., pp. 201–207*).—In conducting experiments with antianthrax vaccine the author observed that paralysis quite frequently occurred in the animals which were being used for experimental purposes. Detailed notes are given on a number of such cases. The symptoms of paralysis appeared from 16 to 31 days after injection of the serum and pure culture. These symptoms were remarkably uniform. A second injection of anthrax bacilli and serum in a rabbit which already showed symptoms of paralysis did not cause an anthrax infection, but the animal died like the other cases of paralysis. It is believed that the poisonous substance, which exercised its effect directly upon the posterior portion of the spinal cord, is analogous to the toxons observed in diphtheria. It is suggested that as a result of the excessive injections of anthrax cultures and serum the blood acquired increased resisting power toward the anthrax bacilli, but lost, at the same time, its normal bactericide properties for destroying toxic substances which caused paralysis.

The existence of chronic pleuro-pneumonia in the interior districts of France, H. Martel (*Rec. Méd. Vét., Paris, 8. ser., 9 (1902), No. 8, pp. 174–179*).—The author presents a general summary of the results of his observations and experiments in determining the extent and prevalence of pleuro-pneumonia in a chronic form in France. From these experiments and observations it is concluded that infected animals may remain contagious for several years. It was shown that the virulence of the virus is preserved without change in infected animals in different foci, and that new foci may form successively in infected animals. In order to avoid outbreaks of pleuro-pneumonia in a virulent form it is urged that veterinarians at abattoirs give special attention to the destruction of any foci of pleuro-pneumonia which may be found in the lungs of cattle.

Pleuro-pneumonia in the mammary gland, E. Nocard (*Rec. Méd. Vét., Paris, 8. ser., 9 (1902), No. 4, pp. 88–92, figs. 3*).—Since it is a well-known fact that the mammary gland of cows, especially when it is active, is very susceptible to inoculation with such diseases as tuberculosis, anthrax, and aphthous fever, the author determined to undertake experiments in inoculating the udder with the virus of pleuro-pneumonia. The experiments are described in detail. The inoculation is made without causing any lesion of the udder. The following results were obtained from these experiments: When the organism of pleuro-pneumonia was introduced into the milk sinus without injury to the mammary gland, pathological lesions were produced similar to those which accompany subcutaneous or intramuscular inoculations. A pure culture of the organism was maintained in the milk. The organism was found in large quantities in the milk of the inoculated udder, for a long time after recovery from the effects of inoculation. The virulence of the organism, recovered from the mammary gland, was tested, and was found to be greater than before inoculation.

Pasteurellosis of cattle in Indo-China, J. Blin and J. Carougeau (*Rec. Méd Vét., Paris, 8. ser., 9 (1902), No. 4, pp. 107–118, fig. 1*).—This disease, which, according to the author, is frequently mistaken for rinderpest in Indo-China, is described in detail and notes are given on its symptoms, lesions, etiology, virulence, and pathogenicity. In buffaloes the disease is observed only in the acute form. The onset is sudden, and the chief symptoms are an acceleration of the respiration, elevation of temperature, and congestion of the mucous membranes. The lesions produced in the acute form are of a congestive and hemorrhagic nature, but it is a remarkable fact that the musculature remains intact. In the chronic form the most serious lesions occur in the lungs and intestines. As a result of the author's studies and experiments, it is concluded that the disease known in Indo-China as rinderpest is a hemorrhagic septicaemia belonging to the group of pasteurrelloses. It is believed that the practice of slaughtering diseased animals is useless. Sanitary measures are more efficacious in restricting the number of infected centers. It is recommended that the sale of diseased animals for meat be prohibited, except where the animals are to be taken immediately to a slaughterhouse. Injections of artificial serum or defibrinated blood are of considerable value in bringing about a recovery of cattle affected with a chronic form of the disease.

Prevention of white scour in calves (*Jour. Dept. Agr. and Tech. Instr. Ireland, 2 (1902), No. 3, pp. 504–510*).—The nature of this disease as determined by Professor Nocard is described in detail. The methods recommended for controlling the disease included the antiseptic treatment of the external genital organs of the cow, and a similar treatment of the navel cord of the calf immediately after birth. The solution for treating the navel cord may contain 70 gr. iodid potash in 2 pts. water, and this treatment may be followed with another solution containing 35 gr. of iodin in 2 pts. of methyl alcohol.

Hints for spaying cattle, D. Wilson (*Jour. Dept. Agr. Victoria, 1 (1902), No. 3, pp. 249, 250*).—The author summarizes, in brief recommendations and directions, the results of his personal observations on this subject. It is recommended that in heifers which are intended for fattening the operation should be performed at about 12 months of age.

Danger from ergot and wild rye, A. T. Peters (*Agriculture [Nebraska], 1 (1902), No. 7, pp. 25, 26*).—Numerous complaints have been received from various parts of the State reporting ergotism in various forms in cattle and other domesticated animals. Brief notes are given on the usual symptoms produced by eating too much ergot in wild rye and from other sources. Attention is called to the desirability of close observation on the part of stockmen for the purpose of detecting the presence of ergot spurs in wild grasses.

Laboratory notes on poison in sorghum, S. Avery (*Jour. Comp. Med. and Vet. Arch., 23 (1902), No. 11, pp. 704–706*).—During chemical studies at the Nebraska Experiment Station prussic acid was found in the living leaf of young and old sorghum plants. Kafir corn was also found to contain this poison. In other plants, however, such as clover, alfalfa, grasses, and corn, no trace of prussic acid was found. Prussic acid is found in sorghum and Kafir corn in the leaves but not in the seed or roots. The amount of the poison in stunted plants appears to be greater than that in vigorous plants.

Equisetum palustre, C. A. Weber (*Arb. Deut. Landw. Gesell., 1902, No. 72, pp. 63, pls. 3*).—A general review is given of the experience of the author and other investigators with regard to the poisonous character of this plant, which evidence is presented to show that the poisonous effects of the plant are not due to its content of silica but rather to some organic substance thus far undetermined. The plant appears to be especially dangerous to cattle, and only rarely affects horses. Notes are given on the anatomical characters, distribution, habit of growth, and means of combating this species. With regard to treatment of poisoned animals, it is recommended that all animals that show symptoms of poisoning by this plant should be immediately removed to pastures where the plant does not grow, and that treatment should be applied according to the symptoms which are manifested.

Screw worm in cattle at St. Lucia, H. Maxwell-Lefroy (*Imp. Dept. Agr. West Indies, Pamphlet No. 14, 1902, pp. 13*).—This bulletin contains an account of the life history, mode of attack, injury, and means of combating screw-worm attacks upon cattle. The insecticides which are recommended for killing screw worms are carbolic acid and sweet oil, carbolic acid alone, Jeyes' fluid, spirits of turpentine, tar, and fish oil. The author recommends that an effort be made to locate the breeding places of the screw flies, and that the flies be destroyed in such localities.

Sour grass and ticks (*Agr. News [Barbados], 1 (1902), No. 7, p. 105, fig. 1*).—Observations are reported on *Andropogon pertusus.* It is claimed that horses and cattle that graze upon this grass are remarkably free from infestation by ticks and other insects, and this is explained by assuming that the sour grass contains a volatile principle which is excreted through the skin and which is offensive to ticks.

Treatment of Strongylidæ in the stomach and intestines of sheep, Moussu and Marotel (*Rec. Méd. Vét., Paris, 8. ser., 9 (1902), No. 12, pp. 292–298*).—The authors prefer the term gastrointestinal strongylosis for the affection produced by the presence of species of Strongylus in the stomach and intestines. In treating cases of this disease the authors obtained best results from feeding 2 to 3 gm. of areca nut mixed with bran to each sheep, according to size. It is recommended that the stables and other quarters be disinfected with quicklime, solutions of sulphuric acid, or sulphate of iron.

Frogs, toads, and carp (Cyprinus carpio) as eradicators of fluke disease, C. W. Stiles (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 220–222, figs. 7*).—Letters from E. N. Hutchinson, of Portland, Oreg., concerning the value of carp in eradicating the fluke disease are reproduced, and mention is also made of a report by W. H. Ashmead to the effect that frogs and toads have been introduced into certain ponds in the Hawaiian Islands for the purpose of destroying snails which serve as intermediate hosts of the flukeworms. It appears from these statements that carp may prove to be of considerable value in this way.

Results of the work against sheep scab in 1901, D. E. Salmon (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 583–589*).—Statistics covering the year 1901 show that under the direction of the Bureau of Animal Industry 886,645 sheep were dipped. It was found that 92.4 per cent of the total number of sheep inspected were free from scab. Of the whole number of sheep dipped during 1901, 51.2 per cent were treated with nicotin and sulphur, 34.8 per cent with tobacco and sulphur, and 13.9 per cent with lime and sulphur. A surprising effectiveness was reported from 1 dipping with these preparations. Five stations reported perfect effectiveness for lime and sulphur, 4 stations for tobacco and sulphur, and 3 stations for nicotin and sulphur. From a comparison of these 3 dips for the years 1900 and 1901, it appears that nicotin and sulphur heads the list in effectiveness, followed by tobacco and sulphur, and lime and sulphur. There appears, however, to be very little choice between these 3 dips.

Sheep scab (*Jour. Dept. Agr. and Tech. Instr. Ireland, 2 (1902), No. 3, pp. 511–514, figs. 2*).—Notes are given on the symptoms, etiology, and treatment of this disease. In outbreaks of sheep scab it is recommended that all affected and exposed sheep be dipped twice, with an interval of 10 days between the dippings; a third dipping may be necessary in some cases to render the treatment thoroughly effective. The desirability is suggested of dipping all sheep twice a year, once after shearing and a second time in early winter, in order to prevent the development of an epizootic of sheep scab.

The vaccination of Algerian sheep and the control of sheep pox, E. NOCARD (*Bul. Agr. Algérie et Tunisie, 8 (1902), No. 14, pp. 338–343*).—A number of objections have been raised against the governmental procedure in combating sheep pox by means of the vaccination of Algerian sheep. These objections were that vaccination creates new foci of the disease and thus contributes to its spread in France. It was also argued that since the operation is not performed on all Algerian sheep there are some which are still subject to the disease and liable to cause serious outbreaks.

A number of writers have also combated the statement that epizootics of sheep pox are produced in France by the importation of Algerian sheep. These various objections are met by detailed arguments, and it is urged that the only measure which is calculated to effectively prevent the importation of sheep pox in France is general vaccination of all Algerian sheep.

The virulence of the wool of sheep affected with pox, after recovery and before being washed, L. DUCLERT and A. CONTE (*Ann. École Nat. Agr. Montpellier, n. ser., 2 (1902), No. 1, pp. 52–56*).—The literature relating to the infectiousness of the wool of sheep affected with pox is briefly discussed. A number of experiments were made for the purpose of determining how long the wool may be infectious, under various conditions. In one experiment a healthy sheep was confined with another sheep which had been inoculated 58 days previously, and had developed a generalized form of the disease 46 days previously. The pustules were still present in large numbers, and in a dried condition on the skin, and material from these pustules was also present on the wool. The healthy sheep did not become infected.

Blood poisoning (malignant edema) in sheep and lambs in New Zealand, J. A. GILRUTH (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 233–236*).—Notes are given on the symptoms, cause, curative treatment, and prevention of this disease, which appears most frequently after some injury in shearing. The temperature is very high, extensive swellings appear on the under parts of the body, and death results in almost all cases. In preventing this disease the author recommends thorough disinfection of the soil in the localities where the disease appears regularly, and treatment of shearing wounds, especially when the latter are of a serious nature.

"Big head" of sheep in Utah (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 230–232*).—A report was received from H. M. Rowe concerning a peculiar disease of sheep in Utah and Idaho. The first symptoms appear to be due to irritation of the lips. The gait soon becomes unsteady, and within about 45 minutes the animal becomes blind. The most conspicuous symptom is an extensive swelling of the head. Great difference of opinion prevails regarding the cause of the disease, but it is believed most probable that some poisonous plant is responsible for this trouble. It was not possible, however, to secure a specimen of the plant which sheepmen suspect of being the cause of the disease.

Hog cholera (*Jour. Dept. Agr. and Tech. Instr. Ireland, 2 (1902), No. 3, pp. 515, 516*).—Attention is called to the importance of making prompt notification of the appearance of hog cholera. It then becomes possible for the proper officials to superintend the isolation of diseased hogs and the disinfecting of the premises.

A variety of the hog-cholera bacillus which closely resembles Bacillus typhosus, M. DORSET (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 566–571*).—An organism was isolated from a hog during an outbreak of hog cholera in Iowa. The organism has been cultivated on artificial media for 18 months, and has undergone no perceptible variation. It stains readily with aqueous solutions of aniline dyes, but not by Gram's method. The bacillus is actively motile and possesses several flagella. No spores have been found. Notes are given on the behavior of this organism upon various nutrient media. It is pathogenic for hogs, rabbits, and guinea pigs. The only striking variation from the ordinary hog-cholera bacillus is its power of fermenting glucose without the production of gas.

Serum diagnosis of glanders, A. RABIEAUX (*Rec. Méd. Vét., Paris, 8. ser., 9 (1902), No. 12, pp. 303–309*).—In testing the value of serum reaction in the diagnosis of glanders the author recommends the following technical method: The serum to be examined was collected in as pure a condition as possible, and was then diluted in sterilized distilled water in proportions varying from 1 : 10 to 1 : 1,500. The diluted serum was then mixed with equal parts of a pure culture of glanders bacillus in peptonized or glycerinated bouillon. The mixture thus obtained was maintained at a temperature of 35 to 37° C., and examined at irregular intervals under a microscope. During these experiments it was found that at a temperature of 35 to 37° C. the 2 kinds of glanderous and nonglanderous serum possessed quite different agglutinating properties. When diluted in the proportion of 1 : 10 to 1 : 50, the difference in the agglutinating power of the 2 kinds of serum are quite manifest. Lower temperatures were found to have the effect of diminishing the rapidity and intensity of the agglutinating process. From the author's experiments it is reported that when a serum manifests a well-marked agglutinating power in a dilution of 1 : 1,000, the animal from which the serum was obtained should be considered glanderous. The method of serum diagnosis is essentially a laboratory method, and is not recommended as replaceing other experimental methods which may be more convenient and satisfactory under certain circumstances.

A peculiar case of glanders in a horse in German Southwest Africa, RICKMAN and KÄSEWURM (*Arch. Wiss. u. Prakt. Thierh., 28 (1902), No. 1–2, pp. 142–152*).—A detailed description is given of a typical case of glanders in a horse, the usual symptoms of this disease being well developed. Not only did the clinical symptoms clearly indicate a case of glanders, but this diagnosis was strongly confirmed by a post-mortem examination. The altered lymphatic glands were found to contain large numbers of bacilli which agreed in all respects with the typical form of glanders bacillus. Pure cultures of these organisms showed the usual behavior of the glanders bacillus. However, in order to make the diagnosis more certain, inoculation experiments were made on guinea pigs, rabbits, and on the ass. All these experiments gave negative results. After the experimental animals had been inoculated for a sufficient length of time they were tested with mallein without showing a reaction, and were, later, killed and carefully examined post-mortem without finding any evidence of the development of glanders. The authors believe, nevertheless, that the original case was one of glanders, and by comparing the symptoms of the disease and the behavior of the bacilli, it appears that the possibility of the case having been pseudo-glanders is excluded.

An epizootic of herpes among young horses, FROEHNER (*Deut. Thierärztl. Wchnschr., 10 (1902), No. 1, pp. 1–3, fig. 1*).—The author described an extensive outbreak of this disease with special reference to the susceptibility of various races and colors of horses to infection. As a rule, the disease was for the most part confined to the shoulder. The parts which were next affected were the neck, flanks, and head. It was noticed that those parts of the skin which were protected by the long hair of the mane and tail were never affected, and it is suggested that the fungi which produce the disease may not be able to penetrate to the skin through long hair, or that the follicles of the long hair are more deeply located in the skin than those of the ordinary short body hair. Notes are given on a large number of remedies which have been recommended for the treatment of this disease, the most of which proved to be of little value. It is maintained that after infection has once taken place at a given point of the skin, epilation can not be prevented. Treatment should be restricted therefore to attempts to prevent the extension of the disease. Antiseptic salves should be repeatedly applied to the parts of the skin immediately surrounding the affected points.

Partial report upon the investigation of horse sickness, H. WATKINS-PITCHFORD (*Agr. Jour. and Min. Rec., 5 (1902), No. 13, pp. 397–401*).—The author has been for some time investigating the nature and etiology of horse sickness in Natal. A number of doubtful points still remain to be elucidated, but observations thus far made indicate that a species of Anopheles is instrumental in transmitting the disease from one horse to another. A number of experiments were made in which mosquitoes were allowed to suck the blood of infected horses and were then allowed to suck the blood from the horses which were healthy. In all cases an elevation of temperature up to about 105.1° F. was observed, together with other symptoms of mild cases of horse sickness. The author was therefore inclined to believe that more work along this line will definitely prove the agency of this mosquito in transmitting the disease.

Latent parasitism and immunization against dourine, BUFFARD and SCHNEIDER (*Jour. Méd. Vét. et Zootech., 5. ser., 6 (1902), Mar., pp. 144–146*).—From observations on asses and dogs the authors believe that the organism of dourine may persist in the affected animal for an indefinite time in a resistant form. This resistant form apparently plays the part of a spore. When the conditions are favorable for the germination of these resistant forms of the trypanosoma, the disease may suddenly break out in an acute form. The authors observed an attenuation of the virulence of the parasite in affected areas.

Acute epizootic leucoencephalitis in horses, W. G. MACCALLUM and S. S. BUCKLEY (*Amer. Vet. Rev., 26 (1902), No. 1, pp. 21–36, figs. 7*).—This paper in essentially the same form has been abstracted from another source (E. S. R., 14, p. 91).

Diarrhea of new-born colts, E. THIERRY (*Jour. Agr. Prat., n. ser., 4 (1902), No. 31, p. 159*).—Notes are given on the symptoms of infectious diarrhea, or diarrhetic enteritis in young sucking colts. In treating this disease it is recommended that the umbilical cord be washed with some antiseptic solution and that special attention be given to disinfection of stables in which the disease occurs.

The treatment of so-called colt lameness, A. MARCUS (*Berlin. Thierärztl. Wchnschr., 1902, No. 20, pp. 303–306, fig. 1*).—While this disease is recognized as very prevalent in many parts of Germany, it is maintained that since the nature of the affection is known the disease may be controlled by suitable treatment. Attention should first be given to the stump of the navel cord, which should be rendered antiseptic and if necessary protected by bandages from contamination. When this treatment is carried out scrupulously infection can not take place and the later symptoms of lameness do not appear.

Petechial fever of horses, and its treatment by the serum of Marmorek (*Jour. Méd. Vét. et Zootech., 5. ser., 6 (1902), Mar., pp. 147–153*).—Numerous experiments were conducted for the purpose of determining the action of Marmorek's serum in the treatment of this disease. Experiments with chemical remedies were without good results. The use of Marmorek's serum, however, gave good results in nearly all cases. The serum was injected in doses of from 10 cc. to 40 cc., and produced a lowering of the temperature and other observable improvement within a short time.

The treatment of morbus maculosus with the serum of contagious coryza streptococcus, O. SOMMERMEYER (*Deut. Thierärztl. Wchnschr., 10 (1902), No. 13, p. 123*).—In the treatment of this disease quite unsatisfactory results were obtained from intravenous injections of colloidal silver preparations. A test was therefore made of a contagious coryza streptococcus serum recommended by Piorkowski. In applying this treatment, 10 cc. of immune serum was injected subcutaneously, and immediately afterwards 20 cc. of normal serum intravenously. As the result of this treatment the temperature was lowered, the appetite reappeared, and complete recovery took place within 10 days.

Contagious coryza and certain analogous diseases, CAGNY (*Rec. Méd. Vét., Paris, 8. ser., 9 (1902), No. 2, pp. 40–44*).—The author states that in his immediate neighborhood contagious coryza is gradually becoming less frequent. Two other diseases occur, however, which closely resemble it. In the case of one of these diseases abscesses are found in the walls of the nasal cavity, while in the other the most conspicuous symptom is violent fits of coughing. The cough is dry and of a hollow sound, and the animals cough 10 to 16 times in rapid succession. In one outbreak 50 animals were affected with this disease, and all recovered. Apparently no pathological lesions were produced. The author is unable to explain the physiology of these two affections.

Treatment of contagious coryza by colloidal silver, BAUMGART (*Berlin. Thierärztl. Wchnschr., 1902, No. 3, pp. 39, 40*).—The author made an extensive test of the efficiency of this remedy in treating contagious coryza. The results were negative and in some instances indicated a harmful effect of the silver preparation. The author concludes that in slight cases of contagious coryza good results may be obtained without the use of colloidal silver, and that in more serious cases combined with sepsis or pneumonia, the colloidal silver exercises no beneficial effect upon the course of the disease.

Successful treatment of tetanus with a slow course by means of antitetanus serum, MARCHAL (*Rec. Méd. Vét., Paris, 8. ser., 9 (1902), No. 1, pp. 16–20*).—Detailed notes are given on the symptoms of a case of tetanus in a mare 6 years of age. During an outbreak of conjunctivitis among horses the mare in question was observed to be affected with this disease. Recovery took place after a few days, and later, symptoms of tetanus appeared. At first 50 cc. of antitetanus serum was given in a hypodermic inoculation. Other injections of serum in similar doses were repeated. Various drugs were also administered, such as chloral hydrate in doses of 60 gm., bromid of potash in doses of 10 gm. night and morning, and morphin. Recovery took place 23 days after the appearance of the symptoms. No lesions were produced by the antitetanus serum at the point of inoculation.

A new method of cultivating the tetanus bacillus, L. DEBRAND (*Ann. Inst. Pasteur, 16 (1902), No. 6, pp. 427–432*).—The author made cultures of tetanus bacillus in symbiotic relation with *B. subtilis*. The association of the 2 species of bacilli in a single culture has the one practical advantage that when associated with *B. subtilis* the tetanus bacillus develops under aerobic conditions; otherwise, it is anaerobic. The serum of animals which have been immunized with a toxin prepared from mixed cultures of these 2 species of bacillus was tested in order to determine whether it possessed any antitoxic properties. Two series of experiments were conducted, in one of which animals received the serum before the toxin, and in the other, received the toxin before the serum. During these experiments it was found that a toxin obtained by a culture of tetanus bacillus in symbiosis with *B. subtilis* may be used to produce a serum in experimental animals which is as active as that obtained by the ordinary methods of cultivating tetanus bacilli.

The action of dry heat on the spores of tetanus bacillus, V. MORAX and A. MARIE (*Ann. Inst. Pasteur, 16 (1902), No. 6, pp. 418–426*).—The authors' experiments on this problem may be briefly summarized as follows: The tetanus bacillus was cultivated in symbiosis with *B. subtilis*. It was found that after heating cultures for 20 minutes at a temperature of 152° C. the spores of the tetanus bacillus were destroyed, while those of *B. subtilis* did not develop within 24 hours. A temperature of 155° C. for 20 minutes did not kill the spores of *B. subtilis*, while those of the tetanus bacillus were destroyed. Dry heat was found to reduce the vitality of the spores of tetanus bacillus and the virulence of the tetanus toxin in a rapid manner.

Glycosuria in rabies, its importance in diagnosing this disease, A. RABIEAUX and E. NICOLAS (*Jour. Méd. Vét. et Zootech., 5. ser., 6 (1902), Jan., pp. 16–28*).—An extensive series of experiments was conducted by the authors for the purpose of determining how constant a symptom of rabies glycosuria could be considered. As a result of these experiments it was found that in carnivorous animals glycosuria is a very frequent symptom of rabies, but unfortunately is not constant enough to serve as the only criterion for diagnosis. It is considered, however, that the presence of glycosuria is of great importance in the diagnosis of rabies when observed in connection with other suspicious symptoms. In dogs it is believed that the demonstration of glycosuria may be considered an important element in diagnosis. In herbivorous animals, such as rabbits, goats, and asses, the condition of glycosuria was found present in all cases of rabies, and this one symptom was therefore considered sufficient for determining the diagnoses of these animals. In herbivorous animals glycosuria may be recognized, not only after death, but during the progress of the disease.

Antirabies immunization by means of intravascular injections of rabies virus, V. Krasmitski (*Ann. Inst. Pasteur, 16* (*1902*), *No. 6, pp. 393–417*).—An extensive series of experiments was conducted by the author on experimental animals, and these results are compared with phenomena observed during the progress of the disease in man and domesticated animals. As the result of the author's experiments it is concluded that intravenous injections of rabies virus are not dangerous, provided the virus is administered in a filtered, diluted emulsion, the emulsion to be previously heated to a temperature of 37° C. and injected slowly. By means of intravenous injection it is possible to render the animals refractory to rabies in a very short period, and the immunity thus produced appears to be more lasting and certain than that produced by other methods of vaccination. Intravenous injections made on rabbits sometimes prevented the development of the disease, even after intracranial inoculation of rabies virus. Rabid nerve virus rendered nonvirulent by any attenuating reagent does not possess an immunizing power. It may be used, however, as a vaccine, and when administered repeatedly in increasing doses renders animals less susceptible to the disease.

A new infectious disease in domesticated animals, A. Aujeszky (*Centbl. Bakt. u. Par., 1. Abt.*, *32* (*1902*), *No. 5, Orig., pp. 353–357*).—During experimental investigations for the purpose of confirming a diagnosis on animals suspected of rabies a virus was isolated, which produced symptoms somewhat resembling those of rabies. It was found by a series of experiments that this virus was in the nature of a toxin, but all bacteriological tests were negative. An inflammatory condition developed at the point of inoculation within 36 to 48 hours, and the symptoms of the disease progressed rapidly from this time until the animal died, a few hours later. While the general symptoms of the disease resemble those of rabies, it can not be confused with the latter disease for the reason that the course of the disease is so rapid, the usual period being from 6 to 10 hours. The pathological alterations which are observed in carcasses of animals dead of the disease include hyperæmia, minute hemorrhages in the internal organs and central nervous system, and distention of the alimentary tract.

Meningitis in dogs, C. Cadéac (*Jour. Méd. Vét. et Zootech., 5. ser., 6* (*1902*), *Apr., pp. 193–196*).—The symptoms of this disease are said to be not very uniform. The cause of the disease is usually found in injuries to the eye and ear; the membranes of the brain and spinal cord may later show pathological lesions, as well as the eye and internal ear. The Eustachian tube may be filled with caseous or calcerous pus, and its walls may be thickened and much injected with blood.

Eczema rubrum of the dog, H. Bär (*Schweiz. Arch. Tierh., 44* (*1902*), *Nos. 1, pp. 1–18; 2, pp. 49–68, pls. 2*).—The literature of this subject is reviewed in a critical manner in connection with a bibliography of 26 titles. The author found during his investigations that eczema rubrum is in no sense a developmental stage of another form of eruption, but is a specific disease of a parasitic nature due to a micrococcus of relatively slight virulence and resisting power. Apparently infection takes place in skin wounds. Not all dogs are susceptible to the disease. In addition to a certain predisposition, a long coat of hair seems to favor infection.

Ringworm in dogs, Matruchot and Dassonville (*Rec. Méd. Vét., Paris, 8. ser.*, *9 (1902), No. 2, pp. 50–71, pls. 3).*—The authors present detailed account of the appearance, life history, and pathogenic action of 4 species of fungi which may cause ringworm disease of dogs. These species are *Trychophyton caninum*, *Eidamella spinosa*, a species of Microsporum, and *Oospora canina*. *T. caninum* is readily cultivated on the ordinary nutrient media. The optimum temperature is 27 or 28° C. *E. spinosa* is also easily cultivated and forms mycelia, perithecia, and chlamydospores. *T. caninum* is pathogenic for dogs and guinea pigs, while *E. spinosa*, according to the authors' experiments, was transmissible only to dogs. In these inoculation experiments the artificial disease differed to some extent from cases of natural infection.

Bothriocephalus latus in cats, B. Galli-Valerio (*Centbl. Bakt. u. Par., 1. Abt., 32 (1902), No. 4, Orig., pp. 285–287*).—The author discusses the literature relating to the occurrence of this parasite in a cat. A number of doubtful cases have been reported, but the author believes that his observations demonstrate clearly that the species in question may occur in the cat. The economic bearing of this question is not discussed.

Death of domesticated animals attributed to bacterial cultures used for killing mice (*Izv. Min. Zem., 1 (1902), No. 14, pp. 296–298*).—A number of cases of death among animals were reported as possibly due to bacterial cultures which had been distributed in the fields for the destruction of small rodents, especially mice. An investigation of the matter was made and from 961 replies to a circular letter it appears that there is no good evidence for supposing that bacterial cultures caused the death of domesticated animals. Epizootics were reported among cats, but the same disease occurred in places where no bacterial cultures had been distributed.—P. FIREMAN.

Fowl plague, E. Centanni (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 4, Orig., pp. 145–152; No. 5, Orig., pp. 182–201, figs. 2*).—A general historical account is given of the discovery and of outbreaks of this disease in various parts of Europe. The name fowl plague is given to distingush it from fowl cholera, since investigations which the author has made indicate that the 2 diseases are distinct. The clinical symptoms are often not well marked, for the reason that the disease proves fatal in so short a period that the symptoms are not observed. Affected fowls refuse to take food and are rapidly overcome by extreme weakness and a tendency to sleep. The comb frequently assumes a violet color. In fowls dead of this disease the color of the skin is sometimes light and nearly normal, but often dark red and spotted. The meat possesses a dark color, but otherwise shows no abnormal conditions. The liver, spleen, and kidneys are enlarged, of a yellowish color, and more friable than in a normal condition. The pericardium is thickened and one of the most constant symptoms of the disease is a more or less marked pleuritis. The blood of affected fowls is exceedingly virulent; experiments showed that fatal infection might be produced by pricking the skin of healthy fowls with a needle which had been dipped in virulent blood. The disease ordinarily runs a fatal course in about 3 days. Experiments were made to determine the extent to which the virus would pass through various kinds of filters. In these experiments the Berkefeld and Chamberland filters were used. It was found that the virus readily passed through either of these filters and that the filtrate was virulent in minute doses. Detailed notes are given on the behavior of the organism on various culture media. It was found that the eggs from affected hens showed characteristic modifications. The albumen was more fluid, and the yolk more friable, pale, and permeated with white streaks. Such eggs were either absolutely infertile or produced embryos which died before the end of the incubation period. In some cases sickly chickens were hatched from them. Experiments indicated that the feces were infectious in chronic cases, but probably not, or only slightly infectious, in acute cases. It was found that the disease did not spread rapidly from one flock of fowls to another, except where healthy birds came in actual contact with affected ones. The resistance of the organism to various physical and chemical disinfectants is not very striking. Ordinary chemical substances in the usual proportions and heat above 60° C. are sufficient to destroy the organism. The author presents a detailed comparison between the characteristics of the organism of fowl plague and those of pneumonia of cattle, South American horse disease, foot-and-mouth disease, diarrhea of young calves, etc. The dog and fox proved in experiments to be refractory to the disease. Inoculation experiments with rabbits were made with doubtful results. Pigeons appear not to be subject to natural infection and the virus was eaten by these birds without becoming infected. In a number of cases hypodermic injection of the virus of the disease in pigeons failed to produce any pathological symptoms. In a few young pigeons, however, a peculiar set of symptoms was produced, of which the most characteristic was the loss of equilibrating power and a tendency to fly or walk in circles, with evidences of dizziness.

Combating fowl cholera, BUHL (*Berlin. Thierärztl. Wchnschr., 1902, No. 13, pp. 193–197*).—This article contains a general account of the nature and symptoms of fowl cholera, with special reference to the various means by which it may be disseminated. Attention is called to the statutory laws on this subject, according to which punishment is provided for carelessly or intentionally having any traffic in or moving about from place to place fowls which are affected with this disease. A bibliography of the subject is appended to the article.

Psittacosis, G. AJELLO and C. PARASCANDOLO (*Arch. Parasit., 5 (1902), No. 2, pp. 294–395*).—The authors present an elaborate discussion of the symptoms and etiology of this disease, together with the appearance and behavior of the pathogenic organism and of the toxin obtained from pure cultures. The literature of the subject is discussed in connection with an extensive bibliography. The authors conclude from their experiments that the bacillus of psittacosis is specifically distinct and possesses specific morphological, physiological and biochemic properties. Filtered cultures are toxic for the ordinary experimental animals and the bacilli produce relatively slight lesions in rabbits and guinea pigs. By means of bacterial cultures it is possible to immunize rabbits and dogs, and the serum of these animals is endowed with a preventive and curative power against the disease.

The bacterial flora of the feces of fowls, together with notes on a new fowl plague, E. JOEST (*Berlin. Thierärztl. Wchnschr., 1902, No. 16, pp. 241–243*).—Notes are given on numerous bacterial organisms which were found in the various parts of the alimentary tract and in the feces of fowls. An organism was isolated from a fowl suffering with a new form of infectious disease, and this organism is believed to be specifically different from all known bacteria. Notes are given on the staining affinities and the behavior of the organism in various nutrient media. The name adopted by the author for this organism is *Bacterium intestinale gallinarum*. The organism is non-motile and apparently does not form spores.

The significance of the recent American cases of hookworm disease (uncinariasis or anchylostomaisis) in man, C. W. STILES (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 183–219, figs. 84*).—Notes are given on the occurrence of hookworm disease in this country, due to infestation by *Uncinaria duodenalis*. A detailed description is presented of this species, together with a brief account of related species which have been found in other domestic animals in this and other countries. The life history of the hookworm is given, together with an account of the source of infection, symptoms of the disease in man, its clinical diagnosis, treatment, and prevention. Abstracts are given of the various cases which have been reported in the United States and a bibliography of the subject is appended to the article.

The burning of dead animals, R. H. MCDOWELL (*Nevada Sta. Bul. 53, pp. 12*).—Brief notes are given on the use of unslaked lime, which may be sprinkled upon diseased fowls in connection with burying them in the ground. Attention is called to the desirability of making a safe disposal of the bodies of dead animals, especially those which die of infectious diseases. For this purpose it is considered that under farm conditions the safest method is to burn the bodies by means of direct fire produced by kerosene oil, wood, and other materials. The destruction of 2 animal bodies in this way cost $1.56 and $5.87, respectively. Notes are also given on the methods of disinfecting stalls and premises after outbreaks of infectious diseases.

Federal inspection of foreign and interstate shipments of live stock, D. E. SALMON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 237–249*).—Attention is called to the great development of the animal industry in this country and statistics are presented showing the number of cattle received at the stockyards and the numbers and value of animals exported to foreign countries. The author presents a number of forcible arguments to show the importance of maintaining federal quarantine and inspection in order to prevent the importation of other dangerous plagues into this country. The author calls attention to the service of the Bureau of Animal Industry in preventing the undue spread of tuberculosis, sheep scab, and other diseases.

Food products from diseased animals, D. E. SALMON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 250–256*).—Attention is called to the desirability of more extensive investigations regarding the effects upon man of eating meat of animals suffering with various diseases. The practices of federal meat inspection in this connection are briefly outlined. Animals suffering from wound septicemia or infested with bladder worms or trichina are condemned. In the case of tuberculosis, the carcass is condemned not only when emaciation is present but when lesions in the internal organs are so extensive as to indicate a serious stage of the disease. Brief notes are also given on the inspection of milk for the presence of tubercle bacilli.

Contagious diseases of animals in foreign countries (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 590–599*).—Brief statistical notes on contagious diseases of animals in Great Britain, Russia, France, Germany, Hungary, Italy, Switzerland, Austria, Netherlands, Belgium, Denmark, Norway, and Sweden.

Report of the veterinarian, A. T. PETERS (*Nebraska State Bd. Agr. Rpt. 1901, pp. 151–190, figs. 15*).—In this report notes are given on sorghum poisoning of cattle, sore mouth of cattle, kidney diseases in horses, paralysis of the hind limbs of hogs, mange in cattle and horses, lice on hogs, and a paper on tuberculosis in swine, by S. Stewart.

Reports of inspectors of stock, H. R. MACKENZIE, W. J. COTHER, and J. E. BATCHELOR (*Jour. Dept. Agr. Victoria, 1 (1902), No. 3, pp. 338–344*).—Brief notes are given on the occurrence and prevalence of various diseases in different parts of Victoria. It is stated that tuberculosis is stationary, or at least not on the increase. The heaviest losses are reported from blackleg in young cattle. A verminous lung disease caused by some species of threadworm is reported as having prevailed to a serious extent. In certain parts of the country pleuro-pneumonia occurred in outbreaks of considerable extent. The "yambuk" disease is also reported as having caused the death of large numbers of cattle.

Statistics concerning the number of animals slaughtered and the number found diseased in the Prussian abattoirs during the year 1900 (*Berlin. Thierärztl. Wchnschr. Nos. 17, pp. 253–259; 18, pp. 265, 266*).—These extensive statistics are compiled in a manner so as to show the number of animals killed and the number affected with the more important diseases, including tuberculosis of cattle and hogs, beef measles, pork measles, and trichina.

Text-book of veterinary medicine, IV, J. LAW (*Ithaca, N. Y.: Author, 1902, pp. 675*).—This volume of the author's text-book on veterinary medicine is occupied with an account of infectious diseases. Each disease is discussed in a thorough manner and the most recent work on the subject is adequately considered in connection with all discussions. The most important diseases considered in this volume are pyemia, septicemia, malignant edema, swine erysipelas, hog cholera, swine plague, hemorrhagic septicemia, strangles, pneumonia in horses, influenza, petechial fever, fowl cholera, distemper in dogs and cats, blackleg, anthrax, glanders, rabies, tetanus, foot-and-mouth disease, milk sickness, variola, contagious abortion, tuberculosis, South African horse sickness, dourine, surra, nagana, Texas fever, ictero-hematuria in sheep, pleuro-pneumonia, and cattle plague.

The veterinary adviser: On the symptoms and treatment of the diseases of domestic animals, B. SCHMIDT (*Piqua, Ohio: Magee Bros., 1902, pp. 148*).—In this volume the author presents formulas as remedies for the various diseases of domestic animals, especially the horse. The diseases are classified according to the organs affected. A brief list of diseases is also appended to the volume, with recommendation of a prescription for each disease.

TECHNOLOGY.

Manufacture of table sirups from sugar cane, H. W. WILEY (*U. S. Dept. Agr., Bureau of Chemistry Bul. 70, pp. 32, pls. 10, figs. 2*).—An account of this industry in the South is based upon personal inspection by the author in Georgia. Notes are given on a large number of soil samples together with chemical and mechanical analyses. The soils represented were almost pure sand and showed a deficiency in potash soluble in hot hydrochloric acid, and to a less extent a deficiency in phosphoric acid. Analyses of numerous samples of sugar cane are also reported, which show a high average percentage of sucrose and usually a low quantity of reducing sugar. Although there are a large number of samples of fine quality, the average coefficient of purity does not quite reach the desired standard of 80. Some of the problems needing further study are the character and adulteration of the sirups now on the market, the use of fertilizers in the culture of sugar cane, the improvement of milling processes, the methods of clarifying and purifying the juice previous to its evaporation, and the production of a sirup of uniform character and its handling to prevent fermentation. The arrangement of a sirup factory with modern appliances is outlined.

The manufacture and preservation of unfermented grape must, G. C. HUSMANN (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 24, pp. 19, pl. 1, figs. 4*).—This bulletin, after referring to the ancient use of unfermented wine, briefly discusses the composition of the grape and the causes and prevention of fermentation, and describes the methods of making unfermented grape must followed in California (E. S. R., 12, p. 794) and in the Eastern States; outlines a simple method of manufacture for home use; and explains the various uses of the product, with recipes, analyses of the must, and prices and statistics.

Report on wine making experiments at the Gard œnologic station in 1901, E. KISER and G. BARBA (*Bul. Min. Agr.* [*France*], *21* (*1902*), *No. 2, pp. 305–321*).—

Changes in the chemical composition of bilberry wine after three and one-half years, R. OTTO (*Proskauer Obstbau-Ztg., 7* (*1902*), *No. 7, pp. 98–100*).—Analyses are given showing the composition of wine fermented with pure yeast cultures, with and without additions of different nitrogenous combinations, like crystallized asparagin, ammonia, ammonium chlorid, etc. The wine was analyzed when first made, and again 3½ years later.

A contribution to a knowledge of the chemistry of cider, A. H. ALLEN (*Analyst, 27* (*1902*), *No. 315, pp. 183–190*).—This paper includes original analyses of apples, apple pulp, typical English ciders, and perry.

Experiments on cider making, report for 1901, F. J. LLOYD (*Jour. Bath and West and South. Counties Soc., 4. ser., 12* (*1901–2*), *pp. 131–149*).

The society's 1901 exhibition of cider, F. G. FARWELL (*Jour. Bath and West and South. Counties Soc., 4. ser., 12* (*1901–2*), *pp. 150–167*).

Observations on the production of vinegar in cellars, W. B. Alwood and R. J. Davidson (*Virginia Sta. Bul. 127, pp. 61-71*).—A further preliminary study is given on the production of vinegar under ordinary farm conditions (E. S. R., 9, p. 1094). Casks holding 50 gal. each were filled with fresh cider on different dates and stored in an ordinary underground cellar having a temperature ranging from 50 to 60° F. A record is given of the chemical changes that took place in the conversion of the sugar to alcohol and the alcohol to acetic acid. The cider thus stored reached its maximum alcohol content in from 23 to 44 days after placing in the cellar. It required from 350 to 418 days' storage before the acetic acid content had reached 3½ per cent. Vinegar analyzing less than 3½ per cent is stated to be too weak to put on the market. Very good vinegar was produced in every instance, but the system is not recommended when vinegar is made in sufficient quantity to warrant a generator.

Parallel with this experiment, 3 series of flasks were filled with 200 cc. each of sterilized cider and kept in a culture oven ranging from 80 to 82° F. for periods varying from 2 to 12 days. One series of flasks was sown with a drop of strong yeast culture. Another series was seeded with the yeast and in addition with a drop of vinegar ferment (*Bacterium aceta*). The tabular record of analyses given shows that no acetic acid was formed in the flasks during alcoholic fermentation. In one series the vinegar ferment was added at the end of 16 days, at which time alcoholic fermentation had apparently subsided. The formation of the acetic acid in these flasks did not take place in a regular increasing ratio in accordance with the time elapsing after adding the ferment. This was owing, it is thought, to the absence of sufficient oxygen in the flasks.

New process in olive-oil making (*California Fruit Grower, 27 (1902), No 761, p. 13*).—It is stated that by the use of centrifugal force from machines similar to the modern sugar house centrifugal machine, 10 per cent more olive oil has been obtained.

Tanning materials, G. E. Colby (*California Sta. Rpt. 1899-1901, pt. 2, pp. 255-259*).—Analysis are reported of 25 samples of canaigre roots and chips, 15 of wattle barks, 3 of oak tan barks, 1 of Chinese gall nuts produced by *Aphis chinensis* in leaves of *Rhus semialata*, and 2 of commercial tannin.

The average results of the analyses of canaigre show a tannin content of 30.6 per cent. Experiments conducted to determine the production of tannin in plants grown from different sections of canaigre root showed that the greatest increase in tannin yield is obtained by planting the upper section of the root. In these tests when the whole root was used the tannin in the new growth was 8,680 times that found in the seed root, and when the top section alone was used the tannin of the new growth was 29,305 times that of the original section.

The results of analyses of the wattle barks produced at the Santa Monica Station have already been noted (E. S. R., 12, p. 995). Analyses of the bark from black wattle trees grown at Berkeley showed 41.40 and 50.05 per cent tannin in the air-dried substance. The bark from the main trees, branches, and large roots of the silver wattle showed, respectively, 35.53, 31.87, and 34.48 per cent of tannin. The bark from golden wattle trees showed 41.60 per cent tannin.

Textile fibers of commerce, W. I. Hannan (*London: Charles Griffin & Co., 1902, pp. 236, ill.*).—A handbook on the occurrence, distribution, preparation, and uses of the animal, vegetable, and mineral fibers used in cotton, woolen, paper, silk, brush, and hat manufactures.

Chemical technology of textile fibers—their origin, structure, preparation, washing, bleaching, dyeing, printing, and dressing, G. von Georgievics, trans. by C. Salter (*London: Scott, Greenwood & Co., 1902, pp. 306, figs. 47*).

The art of paper making, A. Watt (*London: Crosby Lockwood & Son, 1901, 2. ed., pp. XII + 260, figs. 86*).—This contains chapters on cellulose; materials used in paper making; treatment of rags; treatment of esparto; treatment of wood; treatment of various fibers; bleaching; beating or refining; loading, sizing, coloring; making paper by hand; making paper by machinery; calendering, cutting, and finishing; colored papers; miscellaneous papers; machinery used in paper making; recovery of soda from spent liquors; determining the real value or percentage of commercial sodas, chlorid of lime, etc.; useful notes and tables; and a list of papers on paper making.

A new paper stock (*Tradesman, 48 (1903), No. 10, p. 6*).—The successful use at Niagara Falls of cotton hulls as stock for ordinary "writing" and "news" grades of paper is noted.

AGRICULTURAL ENGINEERING.

Report of irrigation investigations for 1901, E. Mead et al. (*U. S. Dept. Agr., Office of Experiment Stations Bul. 119, pp. 401, pls. 64, figs. 12*).—This is the third annual report on irrigation investigations (E. S. R., 13, p. 999), and includes a summary of results by R. P. Teele, and reports by special agents and observers as follows: Irrigation in New Mexico, by W. M. Reed; Irrigation Investigations in the Salt River Valley for 1901, by W. H. Code; Irrigation at the Arizona Experiment Station Farm, by A. J. McClatchie; Studies of the Subterranean Water Supply of the San Bernardino Valley and Its Utilization, by E. W. Hilgard; Duty of Water under Gage Canal, Riverside, Cal., 1901, by W. Irving; Duty of Water in Tule River Basin, California, by A. E. Chandler; The Use of Water in Irrigation in Washington for the Season of 1901, by O. L. Waller; The Distribution of Water from Canals in Idaho, by D. W. Ross; Irrigation Investigations in Montana, 1901, by S. Fortier; Irrigation in Bear River Valley, Utah, 1901, by A. P. Stover; Irrigation in the Grand Valley, Colorado, 1901, by A. P. Stover; Irrigation in the Arkansas Valley, Colorado, by A. P. Stover; Irrigation under the Great Eastern Canal, Platte County, Nebr., in 1901, by O. V. P. Stout; Irrigation Experiments at the Missouri Experiment Station, by H. J. Waters; Irrigation Experiments in Wisconsin, by F. H. King; Irrigation in New Jersey, by E. B. Voorhees; Second Progress Report on Silt Measurements, by J. C. Nagle.

The investigations reported deal mainly with the duty of water in irrigation and the methods and measures for securing the largest and best use of the water supply, but take up incidentally many other related questions. "In the measurements so far made no attempt has been made to control the quantity of water used. The attempt has been to find out how much water is used under present practice. . . . It is the intention to make the investigations of the future deal more and more with what can be done by better methods and more economical use of water."

The results reported show a wide difference between the amount of water entering the main canals and that actually received by the land. Thus, averaging all the measurements of water received by the main canals, it appears that the following quantities of water were used per acre: In 1899, 4.42 acre-feet; 1900, 4.08 acre-feet; 1901, 4.90 acre-feet; average, 4.45 acre-feet. The quantity used, as measured at the heads of the laterals and on the farms, is shown to be in the cases recorded from 30 to 40 per cent less, which represents the loss "between the heads of canals and the place of use, on the assumption that the measurements are representative." The average loss of water from canals was, according to the 1901 measurements, 1.45 per cent per mile, as against 2.47 per cent the previous year. The percentage loss is shown to decrease as the size of the canal increases. Thus the loss from canals carrying 100 cu. ft. per second or more was 0.98 per cent per mile, 50 to 100 cu. ft. per second 2.67 per cent, 20 to 50 cu. ft. 5.22 per cent, less than 25 cu. ft. 7.48 per cent.

The data for duty of water with different crops show, as would be expected, wide variations. Averages of the observed duty for a few crops, with the period during which they require water, are given in the following table:

Water required by different crops, and the irrigating season for each.

Crop.	Depth of irrigation.	Irrigating season.
	Feet.	
Potatoes	3.94	May 17 to Sept. 15.
Alfalfa	3.39	Apr. 1 to Sept. 22.
Orchard	2.76	Apr. 15 to Sept. 2.
Wheat	2.68	Apr. 1 to July 26.
Sugar beets	2.15	July 13 to Aug. 17.
Oats	1.73	May 22 to Aug. 20.
Barley	1.49	June 12 to Aug. 1.
Corn	1.40	July 24 to July 29.

"The average depth given for wheat is undoubtedly too large, on account of the excessive quantities used in Nevada. The season for sugar beets, as given in the table, refers to Montana alone, and is too short for States farther south. It should be extended at least to September 1. Making these allowances, the table shows that in general the crops requiring the most water have the longest seasons. The statements made in this table are of value as showing what crops can be raised with a given water supply. The grain crops require the least water, and require it at a season of the year when the streams supply the most. Orchards, potatoes, alfalfa, and sugar beets require water during the season when the flow of streams is at a minimum, and hence only small areas of these crops can be raised without storing water. On the other hand, these crops give much larger returns than the grain crops."

The report contains summaries of the progress made in experiments with irrigation in the humid region—Nebraska, Missouri, Wisconsin, New Jersey—and of observations on pumping water for irrigation, which are of special interest.

"The measurements of the quantities of water used and lost, and the savings made by the adoption of regulations under which farmers pay for the quantity of water they receive, give reason to believe that the present canals and the existing water supply can be made to serve at least double the area now farmed, with a possibility of still further economies and a further development."

What the Department of Agriculture is doing for irrigation, E. MEAD (*U. S. Dept. Agr., Office of Experiment Stations Circ. 48, pp. 4*).—A brief outline.

Water supply and irrigation in Nevada, L. H. TAYLOR (*Nevada Sta. Bul. 52, pp. 64, pls. 12, maps 3*).—This bulletin discusses the general topographic features of Nevada, precipitation—rain and snow—run off, evaporation, character of streams, subsurface waters, seepage waters, and water storage, with a detailed account of the investigations of the U. S. Geological Survey on the water supplies of the Truckee, Carson, Walker, and Humboldt rivers and other streams. The extent, methods, and possibilities of irrigation in the State are also briefly discussed.

"At the present time probably not less than 325,000 acres of land from which crops are harvested are under water, and nearly if not quite as much more are irrigated for pasturage purposes. While it is not possible to state just where these lands are, it is safe to say that fully half are on the Humboldt River and its tributaries, about one-fourth on the Truckee, Carson, and Walker rivers, and the remainder scattered over the State, generally in small tracts and in isolated localities. Of the cropped area it is estimated that fully one-half is devoted to the production of native grasses for hay, while perhaps over half of the remainder is in alfalfa and other forage crops, and the balance, or about 80,000 acres, is employed for the production of cereals and general farm produce. . . .

"In general the methods of applying water to the growing crops are the most crude. . . . All over the State there is a general lack of system, not only in the practicable application of the water to the soil, but in the administration where community interests exist. There is no attempt on the part of the State to exercise supervision or control of its appropriation and use, and the inevitable result of such neglect, wastefulness, confusion, undefined rights, and, in times of scarcity, litigation, are everywhere apparent. . . .

"The probabilities are that the average duty of water the State over at the present time is somewhere from 60 to 100 acres per second-foot. . . . There is no reason, beside absolute wastefulness in methods of conveying and applying water, why the average duty should not be at least 150 acres per second-foot for the entire State of Nevada."

It is estimated that with improved methods the irrigated area might be increased to 1,000,000 acres, but this would make the need of storage more imperative. The author concludes from his investigations that it is feasible "to construct in the upper portion of the Truckee River basin seven storage reservoirs, with a gross capacity of 835,168 acre-feet, from which there can be drawn annually 288,768 acre-feet," and "that the watersheds tributary to these reservoirs yield sufficient water, even in seasons of minimum precipitation, to fill each of them." He also believes it feasible "to construct in the basin of Carson River five storage reservoirs, with a total capacity of 274,300 acre-feet."

Water storage in the Truckee Basin, California-Nevada, L. H. TAYLOR (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 68, pp. 90, pls. 8, figs. 20*).—The results of surveys and examinations are reported which show that "by constructing various dams and other hydraulic works a large amount of water which now runs to waste can be saved and conducted out upon vacant public land, furnishing a supply also to some of the lands now in private ownership." The author's conclusions regarding the storage possibilities of this basin are stated in the abstract of the bulletin on Water Supply and Irrigation in Nevada given above.

Irrigation systems of Texas, T. U. TAYLOR (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 71, pp. 137, pls. 9, figs. 27*).—This is a revised and enlarged edition of an earlier bulletin on this subject (E. S. R., 11, p. 94). "In the present report Professor Taylor has discussed the principal irrigation systems in general geographic order, and has given statistics as to the location, cost, and benefits of the devices for obtaining water. He has also devoted some attention to the irrigation of rice, a business in which large amounts of capital are being invested. There has been appended a brief statement of the laws governing irrigation in the State of Texas, also some of the facts obtained from the recent census investigation."

Irrigation from Big Thompson River, J. E. FIELD (*U. S. Dept. Agr., Office of Experiment Stations Bul. 118, pp. 75, pls. 6, fig. 1*).—This is a study of the operation of the water laws of Colorado as illustrated by the irrigation from Big Thompson River. The author gives particular attention to the so-called "water-loaning" law, a recent enactment which has a tendency to unsettle existing rights.

Geology and water resources of the Patrick and Goshen Hole quadrangles in eastern Wyoming and western Nebraska, G. I. ADAMS (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 70, pp. 50, pls. 11, figs. 4*).—This report is largely geologic in character, but "deals with some of the problems of water supply for this area and discusses conditions which are to be found over a considerable part of the public-land area," including data regarding irrigation; timber, grass, and agricultural products; settlement and occupancy of public lands; and an appendix giving the desert-lands and Carey acts, and an act providing for the construction of reservoirs on public lands for watering stock.

Report of the engineer, O. V. P. STOUT (*Nebraska State Bd. Agr. Rpt. 1901, pp. 143–150*).—The main feature of this report is a statement of stream measurements made in cooperation with the U. S. Geological Survey, including tables showing the ratio of maximum to minimum monthly discharge (May–September, 1895–1900) of the Loup, North Platte, Poudre, and Arkansas rivers; the daily discharge in 1901 of the Platte River at Mitchell and Columbus, the Loup at Columbus, the Elkhorn at Norfolk and Arlington, the Republican at Superior; as well as miscellaneous stream measurements. Measurements of the quantity of water used in irrigation as already reported in bulletins of this Office are referred to.

Irrigation in the western division, J. Wright (*Agr. Gaz. New South Wales, 13 (1902), No. 11, pp. 1108–1112*).—A brief discussion of water supply, soils, crops, water requirements of crops, and methods of application of water in this district of New South Wales.

Some features of irrigation, W. O. Webber (*Engineer Rec., 47 (1903), No. 2, p. 57*).—This is a discussion, from an engineering standpoint, of the importance of a careful preliminary consideration of rainfall, run off, and duty of water in the construction of irrigation works—reservoirs, ditches, head gates, and flumes.

Waterpowers of the State of Maine, H. A. Pressey (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 69, pp. 124, pls. 14, figs. 12*).

Water-supply notes (*Country Gent.'s Estate Book, 1902, pp. 207–210*).—Data are given in form of tables and notes on the purity of water, water pressure, measurement of the volume of streams, flow of water from reservoirs, hydraulic rams, cost of pumping, volume and weight of water per acre, power required to raise water from deep wells by means of pumps, evaporation and seepage from reservoirs, etc.

The laws of Indiana for constructing ditches and levees, 1901 (*Indianapolis: Indiana General Assembly, 1901, pp. 107+XX*).—A compilation of laws relating to drainage of lands and towns, including those enacted in 1901.

Land drainage (*Country Gent.'s Estate Book, 1902, pp. 203, 204*).—Tabular data are given regarding cost of drainage, weight of drainpipes, number of tiles required per acre, depth of drains, discharge of pipes, rainfall removed by drainage, depth of roots of farm crops, etc.

The bacterial disposal of sewage from country houses, G. J. G. Jensen (*Country Gent.'s Estate Book, 1902, pp. 179–182*).—A brief discussion of the applicability of this method of sewage disposal to rural conditions.

Sewage pollution in the metropolitan area near New York City and its effect on inland water resources, M. O. Leighton (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 72, pp. 75, pls. 8, figs. 4*).

The adaptation of the peat-closet system to medium-sized and smaller towns, Fraenkel, Pfeiffer, and Witt (*Arb. Deut. Landw. Gesell., 1902, No. 74, pp. 76, figs. 23*).—The subject is discussed from the agricultural, sanitary, and technical standpoints. A report by H. von Feilitzen on the use of the method in Swedish towns is given in an appendix.

Road conventions in the Southern States, and object-lesson roads constructed under the supervision of the Office of Public Road Inquiries with the cooperation of the Southern Railway (*U. S. Dept. Agr., Public Road Inquiries Bul. 23, pp. 89, pls. 11*).—This is an account of an expedition for promoting road-making and for building object-lesson roads in the Southern section of the United States, starting at Alexandria, Va., October 29, 1901, and ending at Charlottesville, Va., April 5, 1902. During this time 4,037 miles were covered and object-lesson roads were built at 18 different places, namely, Winston-Salem, Asheville, and Raleigh, N. C.; Greeneville and Chattanooga, Tenn.; Birmingham, Mobile, and Montgomery, Ala.; Atlanta, Columbus, and Augusta, Ga.; Greenville, Columbia, and Charleston, S. C.; Lynchburg, Danville, Richmond, and Charlottesville, Va. An account of the proceedings and the papers read at meetings held in the interests of good roads at these places are given.

Wind power notes (*Country Gent.'s Estate Book, 1902, p. 211*).—Data are given regarding velocity and force of wind, capacity of windmills, power developed by windmills, pumping capacity of windmills, etc.

Engine power notes (*Country Gent.'s Estate Book, 1902, pp. 205, 206*).—The relative merits of steam, gas, hot air, and oil engines are discussed, and data are given regarding the comparative cost of motor power, horsepower of engines, cost of steam haulage and of steam digging.

Electric power on German farms (*Farm Machinery, 25 (1902), No. 574*).—A brief note calling attention to the large use of electric power for agricultural purposes—for driving thrashing machinery, pumps, hay presses, straw cutters, etc.

The transportation of manure over uneven ground, H. DUPAYS (*Jour. Agr. Prat., n. ser., 5 (1903), No. 2, pp. 49–51, figs. 3*).—An arrangement of pulleys, cables, and cars for this purpose is described.

The American plow and the Russian farmer, T. E. HEENAN (*U. S. Consular Rpts., 70 (1902), No. 266, pp. 317–324, figs. 8*).—A brief description is given of some of the principal kinds of plows in common use in Russia, with suggestions as to how American manufacturers may adapt their implements to Russian tastes and conditions.

Development of the disk plow (*Farm Machinery, 25 (1902), No. 574, figs. 12*).—The history of the development of the disk plow is briefly reviewed and the characteristic features of a number of different makes are described.

The Derby land digger (*Jour. Khediv. Agr. Soc. and School Agr., 4 (1902), No. 6, p. 232*).—This steam cultivator, recently put on the market in England, is briefly described and its work commended.

The reaping machine (*Farm Machinery, 25 (1902), No. 571*).—A brief note on the reaping machine invented by John Common, of Denwick, England, in 1811.

A sifting machine for grading oats and freeing grains from ergot, H. WALTER (*Fühling's Landw. Ztg., 54 (1902), No. 24, pp. 887–892*).

Comparative tests of seed cleaning and sorting machines (*Deut. Landw. Presse, 29 (1902), No. 97, p. 787*).

Notes on the building of stables and farmsteads, E. S. WILSON (*Country Gent's. Estate Book, 1902, pp. 193–197, figs. 5*).—Plans for stables and farmsteads are briefly discussed.

The heating of poultry houses (*Deut. Landw. Presse, 30 (1903), No. 2, pp. 13, 14, figs. 7*).—Methods followed especially in the United States are briefly described.

The utilization of waste products, T. KOLLER (*London: Scott, Greenwood & Co., 1902, pp. VIII+279, figs. 22*).—This is termed "a treatise on the rational utilization, recovery, and treatment of waste products of all kinds." Among the waste products which are discussed are many which are of agricultural importance as fertilizers, feeding stuffs, etc., such as town waste, blood and slaughterhouse refuse, tannery and leather wastes, excrement, slag, fish waste, brewers' waste, molasses, etc., but their utilization in agriculture is only briefly referred to.

MISCELLANEOUS.

Report of California Station, 1899–1901 (*California Sta. Rpt. 1899–1901, pt. 2, pp. IV+145–409*).—This contains introductory notes by E. W. Hilgard on instruction in the college of agriculture, numerous articles abstracted elsewhere, lists of exchanges and station publications, and revised reprints of articles or more detailed accounts of work on water (E. S. R., 14, p. 229), olives (E. S. R., 14, p. 441), and feeding sugar-beet pulp (E. S. R., 13, p. 481).

Annual Report of Pennsylvania Station, 1901 (*Pennsylvania Sta. Rpt. 1901, pp. 439*).—This contains the organization list of the station; a financial statement for the fiscal year ended June 30, 1901; a report of the director reviewing the different lines of station work, mentioning the needs of the station and enumerating new lines of work; and departmental reports containing articles noted elsewhere. The following articles in essentially the same form or abridged have been noted from other sources: The complete analysis of feeding materials (E. S. R., 13, p. 320), the determination of sulphur and phosphorus in plant substances (E. S. R., 14, p. 417), methods of dairy feeding (E. S. R., 13, p. 779), the effect of smoke and gas upon vegetation (E. S. R., 13, p. 527), and the agricultural seed supply of Pennsylvania (E. S. R., 13, p. 653).

Annual Reports of the Department of Agriculture, 1902 (*U. S. Dept. Agr. Rpts. 1902, pp. CXXIV+402*).—This includes the report of the Secretary and the chiefs of the different bureaus and divisions on the work of the Department during the year. The report of the Secretary is also published as Report No. 73 of the Department.

Eighteenth Annual Report of the Bureau of Animal Industry, 1901 (*U. S. Dept. Agr. Bureau of Animal Industry Rpt. 1901, pp. 706, pls. 117, figs. 210*).—This includes a report of the chief of the Bureau reviewing the different lines of work during the year, 22 articles noted elsewhere in this issue, and 6 articles already noted from other sources as follows: Emergency report on surra (E. S. R., 14, p. 192); further investigations on verminous diseases of cattle, sheep, and goats in Texas (E. S. R., 13, p. 593); statistics of oleomargarine, oleo oil, and filled cheese, 1900–1901 (E. S. R., 13, p. 990); market classes of horses (E. S. R., 13, p. 1081); mohair and mohair manufactures (E. S. R., 14, p. 383), and the use of eggs as a medium for the cultivation of *Bacillus tuberculosis* (E. S. R., 14, p. 611). Brief articles are included on the following subjects: The horse trade of the United States with foreign countries, sheep feeding in Nebraska, the sheep-scab mite and low temperature, work of the Bureau of Animal Industry indorsed, live stock in Russian Empire, imports of cattle and sheep by Great Britain, wool exports from Montevideo, Arabian wool trade, egg industry in Denmark, eggs in Spain, egg production, and milk flour in Sweden. Statistics are given on the number and values of farm animals in 1900, pork packing in the United States, and receipts and shipments of live stock during 1901. The rules and regulations of the Bureau of Animal Industry issued in 1901 conclude the volume.

Imports and exports of animals and animal products, J. ROBERTS (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1901, pp. 611–637*).—A statistical review for the year 1901.

Annual report of the Bureau of Industries for the Province of Ontario, 1901 (*Toronto: Ontario Dept. Agr., 1902, pp. 46*).—This includes meteorological observations, crop reports, and other statistical matter.

Annual Report of the Department of Agriculture of the Northwest Territories, 1901 (*Rpt. Dept. Agr. Northwest Territories, 1901, pp. 186*).—A general report on meteorological and agricultural conditions, live stock, colonization, agricultural education, public health, etc., in the Northwest Territories.

Report on agriculture, P. GENNADIUS (*Cyprus Dept. Agr. Rpt. 1901–2, pp. 19*).—The following subjects are treated in this account of agriculture in Cyprus: Agricultural implements and machinery, olive-oil industry, nurseries, silkworm rearing, essential oils, diseases of plants, underground waters, and irrigation with reservoir waters.

Industrial progress in North Carolina (*Bul. North Carolina State Bd. Agr., 23 (1902), No. 7, pp. 40*).—Gives lists of cotton, woolen, and silk mills and other industries, and cattle, horse, swine, sheep, goat, and poultry registers.

History of German agriculture, T. VON DER GOLTZ (*Geschichte der deutschen Landwirtschaft. Stuttgart and Berlin: J. G. Cotta, 1902, vol. 1, pp. 485*).—This first volume treats of German agriculture from the time of the earliest records on the subject to the close of the Eighteenth Century. The social and economic conditions of the country at different periods are discussed, and special attention is given to the development of agriculture during the last 50 years of the Eighteenth Century as affected by legislation, the progress of natural science, and improvements in soil cultivation and farm management.

Agricultural and viticultural calendar, V. Vermorel (*Agenda agricole et viticole. Montpellier and Villefranche (Rhône): Bibl. Prog. Agr. et Vit., 1903, pp. 333*).—This calendar, which is the eighteenth of the series, gives a large amount of information in a condensed form which is of value to the agriculturist and viticulturist. Considerable attention is given to the subject of plant diseases and insect enemies, with suggestions for their control.

The country gentlemen's estate book, 1902, W. Broomhall (*London: The Country Gentlemen's Association, Ltd., 1902, pp. VI + 600*).—This book is the coronation edition of the tenth yearbook of the Country Gentlemen's Association. It contains articles on different phases of farm management and many useful notes and memoranda for landowners and farmers, a number of which are noted elsewhere.

Timely hints for farmers (*Arizona Sta. Bul. 45, pp. 215-238, figs. 5*).—This contains reprints of press bulletins issued separately by the station from October 15, 1901, to June 10, 1902, on the following subjects: Something worth knowing about mud, legumes for forage and green manuring, sugar beets, the dairy cow and the weather, extermination of gophers and ants, the rise of the alkali, and *Lippia nodiflora* (see p. 657).

Secondary courses in agriculture, A. C. True et al. (*U. S. Dept. Agr., Office of Experiment Stations Circ. 49, pp. 10*).—This is an extract from the seventh report of the committee on methods of teaching agriculture of the Association of American Agricultural Colleges and Experiment Stations. Cooperation is urged between country districts, villages, cities, and the State to provide means for the maintenance of agricultural courses in high schools. It is believed that the courses of study now in use in most high schools could be easily modified so as to include agriculture as a part of the course. One additional teacher would be necessary for this work, who should if possible be a graduate of some agricultural college. The present programmes for high schools in Indiana, Lowell, Mass., Des Moines, Iowa, and Washington, D. C., are given, with the number of recitation periods per week for each subject. Based on these programmes parallel columns are given showing tentative agricultural courses. It is believed that it would be entirely practicable to so adjust the present high school schedules as to make the teaching of agriculture in these schools fairly satisfactory.

Proceedings of the seventh annual meeting of the American Association of Farmers' Institute Workers (*U. S. Dept. Agr., Office of Experiment Stations Bul. 120, pp. 119*).—This is a detailed account of the proceedings, edited by A. C. True, D. J. Crosby, and G. C. Creelman, a summary of which has already been given (E. S. R., 13, p. 1110).

Report of the Farmers' Institutes of the Province of Ontario, 1901 (*Toronto: Ontario Dept. Agr., 1902, pt. 1, pp. 128, figs. 25*).—This includes a brief account of farmers' institute work in Ontario and numerous papers and discussions

A list of bibliographies of special subjects (*Chicago: The John Crerar Library, 1902, pp. 504*).—This is a classified list of subject bibliographies in the John Crerar Library, Chicago.

NOTES.

Connecticut State Station.—The station has introduced an innovation in the spray calendar. It has issued an attractive wall calendar, with formulas on the margin for making the common insecticides and fungicides, and leaves on the calendar pad describing briefly the common injurious insects and diseases affecting a long list of vegetables, fruits, shade trees, etc., arranged under the plant affected, together with advice as to the treatment to be given. As such a calendar is likely to be quite generally preserved, it will serve to keep the subject of spraying constantly before the farmer or orchardist, and place the necessary information where it can be readily found when needed.

Connecticut Storrs Station.—A laboratory for work in dairy bacteriology has recently been fitted up, which is thought to be the best equipped laboratory for the purpose in New England. Investigations are under way with reference to the production of soft cheese, and it is hoped that through cooperation with this Department a new industry may be introduced in that section.

Iowa College.—According to a note in *American Agriculturist*, a new feature of the short course in stock judging at the college this year was a slaughter test, for the purpose of demonstrating the difference between different classes of animals, from the prize winner to the cow "canner." Four animals were used—the Angus steer Thistle, the winner of 4 first prizes at the International, and three others bought at the Omaha stock yards. These included an Angus heifer, a Shorthorn steer that had roughed it through the previous winter but was a "market topper" the day he was purchased for the test, and a Shorthorn cow—a typical "canner" such as are dried off and hurried to market. These were slaughtered and cut up by experts. Thistle dressed 69 per cent of meat, the Angus heifer 61.3, the steer which had roughed it 57, and the canner cow 43.2 per cent. The most radical difference in the carcasses of Thistle and the other steer was about the kidneys and loins. "While Thistle showed a fullness about the kidneys and the floor of the loin, the steer showed a great cavity here," attributed to the wasting away of these parts as a result of insufficient feed in the winter, which subsequent fattening could not correct. The demonstration proved a very interesting and instructive feature of the course.

Maryland College.—The contract has been awarded for the erection of a new dormitory, for which the last legislature made an appropriation of $25,000. The building is to be completed in the early fall.

Massachusetts College and Station.—President H. H. Goodell has been granted leave of absence on account of poor health, and has gone to the island of Nassau to recuperate. The college has asked the legislature for an appropriation of a little over $20,000 to make up the deficit caused by the shrinkage in interest on college funds, to complete the heating plant and new dining hall, and to fit up an agricultural laboratory. A new feeding-stuffs bill, giving the station increased authority in the matter of inspection, is before the State legislature. The dairy school the past winter proved a marked success and was attended by 30 students. H. A. Ballou, a graduate of the college who has been taking post-graduate work, has accepted the position of government entomologist of the British West Indies, with headquarters at Barbados. H. M. Thomson, assistant agriculturist of the station, has resigned to take charge of a large estate in Thompson, Conn., and is succeeded by F. R. Church, a graduate of the college in 1902.

Missouri College.—The publication of a series of bulletins on Agriculture in the Public Schools has been undertaken, in which it is intended to present in a systematic way for the use of teachers the principles of agriculture and horticulture. Two bulletins of the series have been published, one on The Principles of Plant Production—The Seed. Part 1 of this bulletin is devoted to the processes of germination and the conditions affecting germination; part 2, to the selection and testing of seeds of different kinds, and part 3, to a series of simple experiments intended to illustrate features of seed germination. The other bulletin belonging to this series is on Plant Propagation—Some Phases of Practical Horticulture Adapted to Use in Public Schools. This bulletin devotes a little space to directions for preparing window boxes, and then takes up methods of propagation, describing and illustrating propagation by seed, cuttings, layering, grafting, and budding. A few lines are devoted to insects and fungus diseases, and also some space to suggestions for growing kitchen vegetables.

North Carolina College and Station.—J. S. Jeffrey, of St. Catherines, Canada, has been appointed poultryman of the station and assumed charge of the work February 1. Mr. Jeffrey was educated at the Ontario Agricultural College at Guelph, and has had considerable experience in raising poultry, as well as in lecturing on the subject. A bill before the State legislature appropriating $50,000 for the erection of an agricultural building has been favorably recommended by the joint committee on agriculture.

Oklahoma College and Station.—R. C. Obrecht, B. S. A., a graduate of the Iowa Agricultural College, and formerly assistant at the Indiana Station, has been appointed assistant in animal husbandry in the college and station to fill the vacancy caused by the resignation of J. S. Malone.

Pennsylvania Station.—Leonard R. Cook, assistant chemist of the station, has resigned to accept a position in Cuba.

South Carolina Station.—Cooperative experiments on the coast with Sea Island cotton, rice, and trucking crops are under process of organization.

Tennessee University and Station.—John R. Fain, formerly farm manager, has been made assistant agriculturist in the station and assistant professor of agriculture in the university. Members of the station staff have been cooperating with the State department of agriculture in holding farmers' institutes. During the past three years some 200 addresses have been delivered to about 40,000 farmers. Chemical investigations now in progress with winter wheats from various sections of the country indicate that those grown in Tennessee show a considerably higher protein content than from other sections.

Utah College and Station.—R. W. Clark, formerly assistant agriculturist of the Alabama Station, has been elected professor of animal industry, vice F. B. Linfield, who, as previously noted, has gone to Montana. Professor Clark entered upon his duties in the college and station January 1. According to a newspaper report, the State legislature has favorably reported a bill providing for the establishment of three experiment farms, to be located by officers of the experiment station and under the control and management of that institution. The measure as introduced provided for five such farms, but the number was reduced, and a corresponding reduction made in the amount of money appropriated.

U. S. Department of Agriculture.—Congress has appropriated $1,500,000 for the erection of a new building for this Department. The work of modifying the plans previously secured, so as to adapt them more definitely to the needs of the Department and to the reduced appropriation, will be taken up at once. Secretary Wilson has designated D. E. Salmon, B. T. Galloway, and A. C. True to act as a building committee.

John Hamilton, secretary of agriculture of Pennsylvania, has been appointed farmers' institute specialist in the Office of Experiment Stations, and will enter upon his duties April 1.

AGRICULTURAL COLLEGE AND EXPERIMENT STATION EXHIBIT.—An appropriation of $100,000 has been made by Congress to enable the United States Government Board of the Lousiana Purchase Exposition to arrange with the colleges of agriculture and mechanic arts and the agricultural experiment stations "for an exhibit of the progress of education and experimentation in agriculture, the mechanic arts, and animal husbandry."

DEPARTMENT OF AGRICULTURE IN THE TRANSVAAL.—The first number of the *Transvaal Agricultural Journal* has recently been received by this Office. The *Journal* is the organ of the newly established agricultural department at Pretoria, and this initial number tells us something of the organization, aims, and purposes of the new department. Its director is Prof. F. B. Smith, formerly of the Southeastern Agricultural College at Wye, England, who will be pleasantly remembered at a number of the experiment stations in this country, which he visited in the summer of 1900. Director Smith characterizes the department as "an administrative and advisory department that shall exercise all the functions necessary for the support, encouragement, and advancement of the rural industries of the country." Its scope will include studies and investigations upon various problems connected with agriculture, such as animal and plant diseases, injurious insects, soils, the use of fertilizers, irrigation, breeding, poultry farming, dairying, etc. A chemical laboratory and a botanical department are contemplated, and the services of veterinary surgeons, entomologists, and fruit and dairy experts are to be provided. Dr. Joseph Burtt Davy, recently connected with the California University and Station, has been elected agrostologist and botanist in the new department, and will take up his duties there about the 1st of May. It is the intention of the government to establish meteorological stations throughout the country as soon as the necessary instruments are available. The department has issued a handbook for the guidance of settlers, and will publish from time to time pamphlets and circulars upon topics of importance to the farming community. The *Agricultural Journal* will be issued quarterly at the outset, and is planned to be a popular journal for disseminating practical information and recording the results of the work of the department, as well as of work in other countries which is of local interest. It will evidently be conducted on a plan similar to that of the agricultural journals in other English colonies, which have fulfilled a most useful mission.

BUREAU OF AGRICULTURE OF THE PHILIPPINE ISLANDS.—The organization of this bureau, as shown by its first annual report, is as follows: F. Lamson-Scribner, chief; E. D. Merrill, botanist and assistant agrostologist; C. W. Dorsey, soil expert; W. S. Lyon, expert in tropical agriculture; Thomas Hanley, expert in plant culture and breeding; James H. Shipley, expert in farm machinery and farm management; John W. Gilmore, expert in fibers (resigned), and G. M. Havice, superintendent of San Ramón farm, island of Mindanao. A brief account of the organization and work of the bureau is given elsewhere (p. 621).

AMERICAN TOUR OF GERMAN AGRICULTURISTS.—A party of 46 German agriculturists, landowners, and students, including representatives of the German Agricultural Society, will make a tour of this country during May and June for the purpose of studying American agriculture. The details of the tour have been largely in the hands of J. I. Schulte, of this Office, who has been designated by Secretary Wilson to act as conductor of the party. Arriving at New York about April 29, the party will proceed west via Washington, Cincinnati, Lexington (Ky.), St. Louis, Kansas

City, Ames (Iowa), Omaha, Denver, Salt Lake, and San Francisco. Several of the experiment stations will be visited en route, together with stock farms, stock yards, and packing houses, breweries and distilleries, sugar-beet farms, irrigation works about Greeley, Colo., and other features of agricultural interest. Six days will be devoted to visiting different points of agricultural and horticultural interest in California, and from four to five days to a similar itinerary in Oregon and Washington. En route east stops will be made at some typical Montana ranches, and in North Dakota a day will be spent at the experiment station and on some of the large wheat farms in that locality. The milling interests at Minneapolis will be inspected, and visits made to the Minnesota and Wisconsin experiment stations. The dairy interests will be studied in southern Wisconsin, visits to typical dairy farms, creameries, and cheese factories being contemplated. Arriving at Chicago via Milwaukee, the party will spend several days in looking over the live-stock and packing interests, the manufacture of agricultural machinery, and other industries. The route east will be through Michigan and New York, to look over the fruit industry and other agricultural features of these States and spend a day at Cornell University. At Boston the truck gardening carried on in the vicinity, the park system of the city, and a horse farm in a neighboring town will be viewed, and on the way back to New York there will be opportunity to see the culture of tobacco in the Connecticut Valley, and especially the method of growing this crop under shade. The party will sail for Germany June 30.

PRIZE COMPETITION.—The Association of Thomas Phosphate Works (*Verein der Thomasphosphat fabriken*), of Berlin, has offered a series of prizes for investigations on the increase of fertility in soils by the action of bacteria and other micro-organisms, under the influence of mineral fertilizers, with special reference to manuring with basic slag. The announcement refers to the progress which has been made in studying the relation of bacteria to the assimilation of nitrogen, nitrification, etc., and suggests that bacteria have an important influence on the chemical-physical condition of the soil by transforming the fertilizing ingredients of the soil into assimilable form, by improving the physical properties of the soil, etc. To encourage investigations on this subject, which are thought to be of great practical importance to agriculture, the association offers prizes amounting to 40,000 marks (nearly $10,000), as follows: First prize, 15,000 marks (about $3,600); second prize, 10,000 marks (about $2,400); third, 6,000 marks (about $1,450); fourth, 4,000 marks (about $960). The remaining 5,000 marks are at the disposal of the judges, to be awarded for valuable scientific and practical results in the same direction. The competition is open to all, without regard to nationality. The papers, written in German, are to be sent to the association (Hafenplatz 4, Berlin S. W.) not later than February 1, 1906. The board of judges consists of Dr. L. Hiltner, of Munich; Prof. Alfred Koch, of Göttingen; Professor Remy, of Berlin; Prof. A. Stutzer, of Königsberg, and Director H. Wilfarth, of Bernburg.

MISCELLANEOUS.—A brief review of the proceedings of the international weather-shooting congress, held at Gratz in July, 1902, is given in a recent number of *Nature*. The director of the Vienna Central Bureau of Meteorology and Terrestrial Magnetism, Professor Pernter, was the general reporter of the congress, and the proceedings appear as a publication of his bureau. In summarizing the results he states that the effect of weather shooting, based on expert evidence, appears not only doubtful but indeed improbable, when all circumstances and different weights of opinions are considered. The opinion seemed to prevail, however, that the firing should not be given up, but continued until it is proved that it has not the desired effect.

The government of German East Africa has recently established a biological agricultural institute at Amani, with Prof. A. Zimmermann as director and botanist. The staff includes in addition to the director a chemist, zoologist, secretary, and three planters. A laboratory and dwelling to cost about $16,000 are building. The lines of work to be undertaken include the investigation of the food requirements and habits of growth of tropical cultivated plants, study of insect pests and fungus diseases and methods of eradicating them, analysis of soils and fertilizers, examination of animal and vegetable products intended for export or home consumption, and a study of the flora and fauna of German East Africa.

We note from *Science* that Sir William Macdonald, of Montreal, has donated a further sum of $4,500 to the Macdonald Institute at the Ontario Agricultural College, Guelph, to complete the furnishing. This makes a total of $175,000 given by Sir William to this institute.

C. Martin, director of the dairy school at Mamirolle, France, has been retired at his own request and is succeeded by M. Houdet.

The *Biochemisches Centralblatt*, an abstract journal for biochemistry, covering the field bordering on medicine and chemistry, is one of the latest of the new scientific serials. Judging from the numbers issued thus far, it will review papers on the physiology of human nutrition, hygiene, sanitation, milk and water supply, ferments, toxins, parasites, immunization, etc. It will be issued semimonthly.

In a statement of the needs of the University of Oxford, circulated by the vice-chancellor, better endowment was asked, among other things, for the Sibthorpian professorship of rural economy (now suspended).

A laboratory has been opened in the gardens of the Royal Botanic Society at Regent's Park, London, in which classes for instruction in botany and "horticultural chemistry" are held three days a week. The laboratory has been erected and equipped under the auspices of the technical education board.

A committee has been formed in Germany to provide for the erection of a memorial at Munich to Prof. Max von Pettenkofer, in recognition of his important contributions to sanitation and hygiene.

The German Government has appropriated $15,000 for research for the study of the relation between tuberculosis in man and cattle.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director*.

EDITORIAL DEPARTMENTS.

Chemistry, Dairy Farming, and Dairying—The Editor and H. W. Lawson.
Meteorology, Fertilizers and Soils (including methods of analysis), and Agricultural Engineering—W. H. Beal.
Botany and Diseases of Plants—Walter H. Evans, Ph. D.
Foods and Animal Production—C. F. Langworthy, Ph. D.
Field Crops—J. I. Schulte.
Entomology and Veterinary Science—E. V. Wilcox, Ph. D.
Horticulture—C. B. Smith.
With the cooperation of the scientific divisions of the Department.

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TEXT FIGURES.

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EXPERIMENT STATION RECORD.

VOL. XIV   APRIL, 1903.   NO. 8.

The total appropriations made for the U. S. Department of Agriculture by the two sessions of the Fifty-seventh Congress aggregate $12,005,133.80. Of this amount $10,687,120 was appropriated for current expenses in the usual way, $1,000,000 was a special appropriation for the purpose of eradicating the foot-and-mouth disease in New England, $250,000 was for the purpose of inaugurating authorized work on the new agricultural building, and $68,013.80 was to meet certain deficiencies. The net increase for the entire Department over the appropriations made by the Fifty-sixth Congress was $2,228,753.80.

The appropriation provided by the recent session of Congress for the next fiscal year amounts to $5,978,100. Including an emergency appropriation of half a million, this is an increase of $769,140 over the appropriation for the current year. Nearly every bureau and division receives additional funds, but the wording of the appropriation act mentions very few new undertakings. The increases are for the most part to enable an extension of the work of the Department along its present lines, rather than to take up new special features. The largest increases are for the Bureaus of Animal Industry, Plant Industry, Forestry, and Soils.

The Bureau of Animal Industry receives an increase of $100,000 for the extension of its meat and other inspection work, making a total of $1,287,380; and an emergency appropriation of $500,000 is placed at the disposal of the Secretary of Agriculture to stamp out the foot-and-mouth disease, which has recently raged in several of the New England States, and other contagious diseases of animals which may appear.

The Bureau of Plant Industry receives a total increase of $42,200 for its work in vegetable pathology and physiology, botanical investigations, studies of the pomaceous fruits and their handling, and the experiments with grasses and forage plants. These increases will enable more extensive work in plant breeding, especially to secure crops resistant to alkali, disease-resistant beets, the hardy orange, and the improvement of Indian corn; a continuation on a larger scale of the field trials with nitrogen-fixing organisms in growing leguminous plants, and a larger amount of attention to plant diseases, notably the Texas root rot of cotton and the California vine disease. The increase for botanical investigations will be used for developing the studies of poisonous plants, particularly on the western ranges. The fund for the purchase of seeds for Congressional distribution is increased by $20,000, making the amount $290,000. An additional $10,000 is allowed to be expended out of this fund for the introduction of seeds and plants from foreign countries, which raises the fund for that purpose to $30,000. The total for the Bureau is $674,930.

The amount for the Bureau of Forestry is increased to $350,000, which is $58,140 more than the current appropriation, and will enable an extension of the forestry and timber investigations and the preparation of working plans for owners of woodlands. The Bureau of Soils receives $212,480 for its soil survey and tobacco work, $42,800 more than the present year.

The scientific staff of the Weather Bureau is increased somewhat, an assistant chief being added, and the Bureau is authorized to erect five new observatories, and to establish cable communication between Block Island and Narragansett Pier, with terminal buildings and equipment at each place. Its total appropriation amounts to $1,248,520.

The appropriations for the experiment stations in Hawaii and Porto Rico are increased to $15,000, making them uniform with the stations in other States and Territories; and $5,000 is appropriated for taking up the farmers' institute work with a view to assisting the organizations in the different States and Territories and making them more effective means for the dissemination of the results obtained at the Department and at the experiment stations. As previously mentioned, John Hamilton, of Pennsylvania, has been appointed farmers' institute specialist in the Office of Experiment Stations. The increases, together with the appropriations for the Office proper and for the irrigation and nutrition investigations in its charge, bring the total up to $895,000.

The Division of Statistics is raised to the grade of a bureau, and given an increased appropriation of $15,500 for general maintenance, making a total of $156,660.

Other items carried by the act are $85,300 for the Bureau of Chemistry, an increase of $11,600; $77,450 for the Division of Entomology, an increase of $10,000; $51,850 for the Division of Biological Survey, an increase of $6,000; $229,320 for the Division of Publications, which does not include the funds for printing the Department publications, except $105,000 for Farmers' Bulletins; $16,000 for the Division of Foreign Markets; $35,000 for Public Road Inquiries, an increase of $5,000; $20,000 for the Library; and $138,210 for administrative, contingent, and general expenses.

The Department's allotment out of the general printing fund is $185,000, an increase of $10,000, and $300,000 is provided annually for printing and binding a half million copies of the Yearbook. Adding to this the cost of the regular and special reports, which are printed by order of Congress, brings the amount for printing the Department publications up to approximately three-quarters of a million dollars.

In the last fiscal year the Department issued 757 publications, in an aggregate edition of 10,586,580 copies, some six million of which were Farmers' Bulletins. The cost of printing the publications is now equivalent to less than 20 per cent of the total appropriation for the Department, whereas during the first twenty years of its existence the cost of printing was more than half of the whole expenditure; that is, the cost of distribution of information considerably exceeded the amount expended in its acquisition. Although the number and cost of publications increases steadily every year and the output is now enormous, the productive power of the Department has increased in far greater proportion, and where one thousand dollars is now spent for the dissemination of information, five thousand is expended in the acquisition of knowledge.

The increase in appropriation for the Bureau of Soils provided for next year will be used in extending the soil survey and in the tobacco work. Surveys will be made this season in thirty-two States, instead of twenty-six as the past season. Twenty parties are now preparing to go into the field for the season's work, which will be taken up, as a rule, April 1. The assignments for these parties cover three periods in each case, i. e., April 1 to July 1, July 1 to October 1, and October 1 to January 1. A change of location is frequently indicated for each period, and this is usually made in conformity with the advancing season. For example, one field party will survey the tobacco soils between Viroqua and Sparta, Wis., during the first quarter, then proceed to Davidson County, Tenn., for the second quarter, and spend the last quarter in Lauderdale County, Ala. Another party will work in the Connecticut Valley during the spring and summer, extending the survey of 1899 up the northern boundary of Massachusetts, and during the last quarter of the year will survey the southeastern portion of the Harpers Ferry district in Virginia. A third party will spend the first quarter near Provo, Utah, the second in the Milk River district of Montana, and the last in a survey of the area between The Needles, California, and Yuma, Ariz., in which it will be joined by three other field parties.

In several cases the entire season will be spent in the same State or region. This is the case with the survey of Long Island, and of the Santa Clara and Sacramento valleys in California. Parties will spend the whole season in Illinois and in Louisiana making surveys in several localities of these States, with the aid and cooperation of the experiment stations.

In all, over fifty counties and localities are mentioned in the assignments for the year, which will be found on p. 825. This indicates the wide distribution of the work as contemplated in the season's campaign.

The tobacco investigations will be confined principally to experiments with the Cuban filler tobacco in Alabama, the central part of South Carolina, and Eastern Texas, where soils have been located similar to those on which it is successfully grown. Five parties will be sent into the field this season. One of these will be assigned to the general charge of the work in Connecticut, with headquarters at Hartford, and another will operate in Ohio. The headquarters for the Cuban tobacco work will be in eastern Texas, where a party of six will be located. Smaller parties will be in charge of the work in Perry County, Ala., and Darlington County, S. C. The work will be largely cooperative, and will be carried on with the assistance of local growers.

The Department is to have a model school garden on its grounds the coming season, as a result of the interest which has been aroused in the normal school of the District.

The horticulturist, Prof. L. C. Corbett, of the Bureau of Plant Industry, gave a course of lectures at the school on plant propagation and garden work in the winter of 1901–2, and last season the Department furnished seeds and plants for about forty school gardens in the District. During the past winter nearly one hundred young women from the normal school have had practical instruction in plant propagation at the Department, a small greenhouse being set aside for the purpose. The pupils did all of the work connected with the preparation of the soil, potting the plants, and managing the house, under the immediate direction of the instructor in botany in the school.

A small piece of land on the Department grounds has been allotted for the school garden, which will be conducted under the direction of several of the pupils who have had instruction the past winter. This tract will be divided up into miniature vegetable and flower gardens, to be worked by pupils from a school near by, small prizes being provided by the instructor in botany in the normal school.

Collections of vegetable and flower seeds for gardens have been sent out to several hundred schools which have requested them, and a large number of calls have been received from village improvement societies and similar organizations. The latter it has been impossible to meet, unfortunately, out of the quota of seeds placed at the disposal of the Secretary.

These facts are further indication of the wide interest which is felt or can be aroused in these matters by a little effort and encouragement, especially when the encouragement comes in the practical form of providing the wherewithal and the directions for making a beginning.

NEW BUILDINGS AT THE NEW HAMPSHIRE AND MISSOURI AGRICULTURAL COLLEGES.

One of the most evident signs of the better financial support which is being accorded our agricultural colleges is the increasing number of new buildings provided for their work and that of the experiment stations. In the past two years more than twenty-five new buildings for class-room instruction and laboratories for the agricultural colleges and the experiment stations have been provided by State appropriation.

In several cases these have been large, imposing buildings, designed to house the principal departments of the agricultural college, and comparing in size and general character with any on the college campus. In other cases they have been intended for a group of related departments, or for some single line of instruction and research. But they have uniformly been of a style of construction which gives character and an air of permanency to the departments which they represent, and is in marked contrast to the buildings which public sentiment made possible a few years ago.

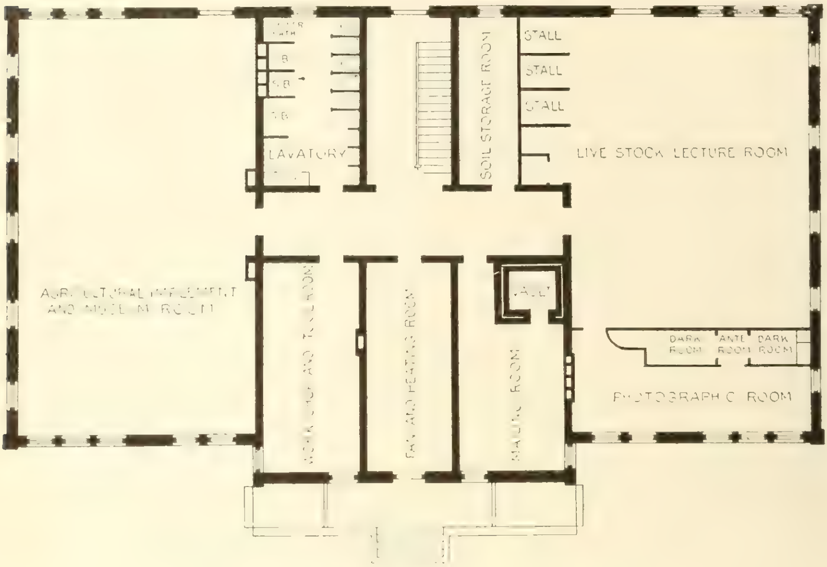
This improvement in equipment has come as a response to popular sentiment and the real needs of the agricultural work, and can not be said to be an anticipation of the needs of that department of instruction. In this respect the result is encouraging and inspiring to the friends of agricultural education.

The new agricultural building at the New Hampshire College of Agriculture and Mechanic Arts, known as Morrill Hall (Pl. I, fig. 1), is intended to house the departments of agriculture, including agronomy and animal industry, horticulture and forestry, and botany. These departments have heretofore occupied a building jointly with the experiment station.

The State legislature in 1901 appropriated $30,000 for the building, which was begun in May, 1902. The college assumed the cost of preparing the foundations, and the contract was made for the building with the attic unfinished. The contractor's work is now nearly completed and the building will be occupied as soon as it can be equipped.

The dimensions on the ground are 58 by 110 feet, with a projection in front 14 by 44 feet, which provides for entrances. The building is constructed of brick with dressed granite trimmings and a slate roof. All partitions are of brick, and below the attic wood is limited to floors, casings for doors and windows, baseboards, and chair rails.

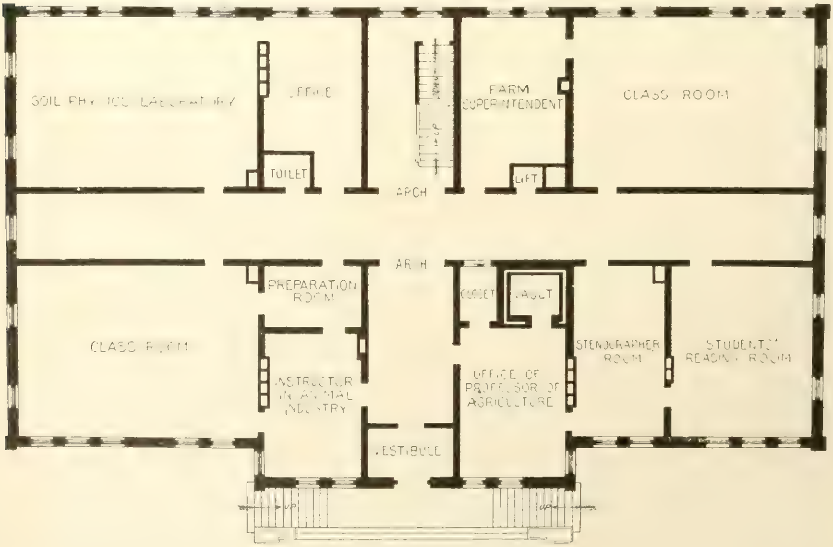
A feature of the building is the mortar for the outside courses of brick, which was prepared from selected lime containing the least possible percentage of magnesia, in order to prevent the white coating which so often disfigures brick buildings.



BASEMENT PLAN

FIG. 1.—New Hampshire Agricultural Building.

In the basement of the building (fig. 1) is an implement museum, 32 by 54 feet, and a live-stock amphitheater, 32 by 43 feet; also photographic room, lavatory, and storerooms. The walls in the basement are whitened, making the rooms light and cheerful.



PLAN OF FIRST FLOOR

FIG. 2.—New Hampshire Agricultural Building.

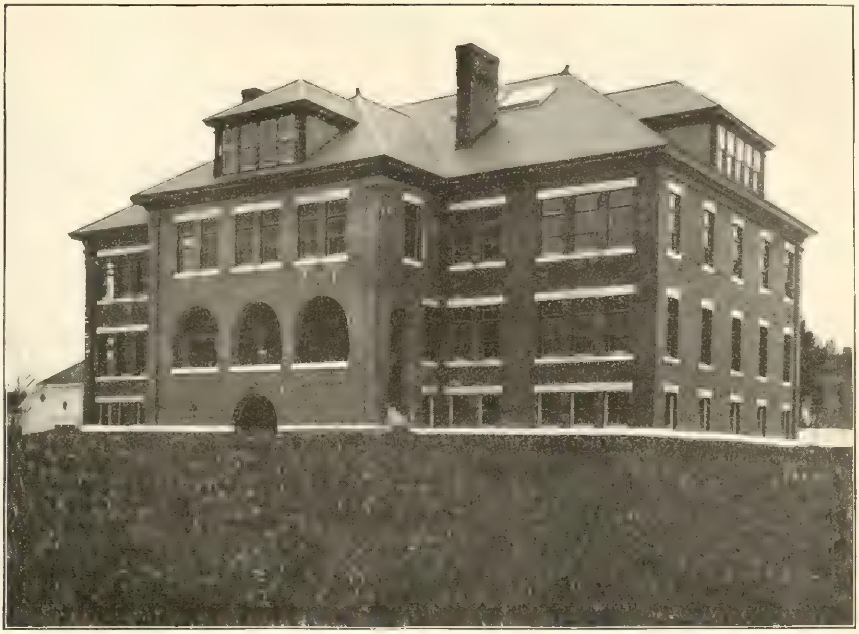


FIG. 1.—AGRICULTURAL BUILDING, NEW HAMPSHIRE AGRICULTURAL COLLEGE.

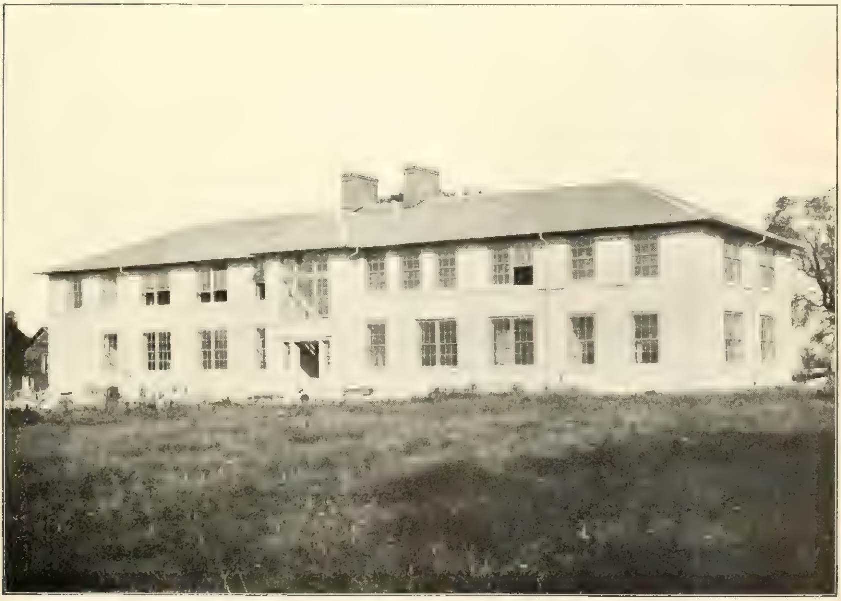
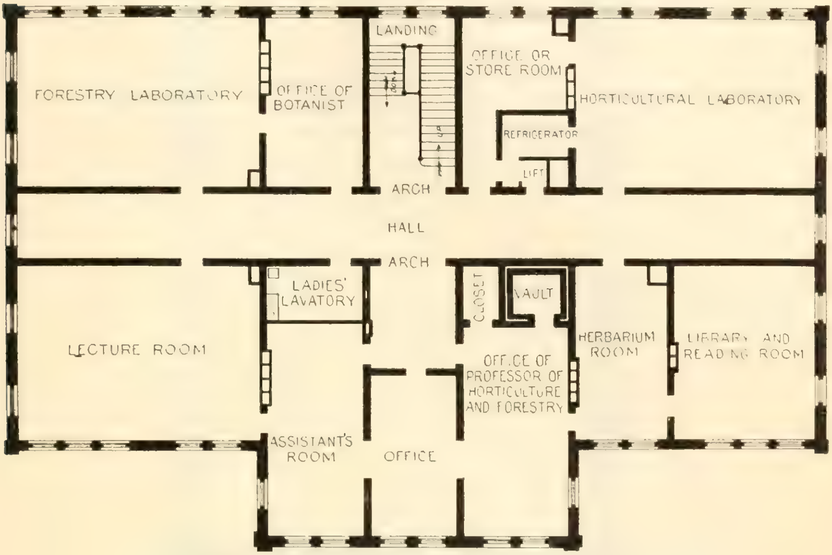


FIG. 2.—DAIRY BUILDING, MISSOURI AGRICULTURAL COLLEGE.

The first floor (fig. 2) contains a soil laboratory, 22 by 36 feet, class rooms for animal husbandry and agronomy, each 22 by 32 feet, offices, and reading room.



PLAN OF SECOND FLOOR

FIG. 3.—New Hampshire Agricultural Building.

The second floor (fig. 3) contains laboratories for forestry and horticulture, each 22 by 36 feet, class room 22 by 32 feet, offices, reading room, and herbarium. The walls of all rooms on the first and second floors are tinted in subdued colors.

When finished, the attic will contain a room 29 by 47 feet for the classes in drawing, which will be lighted from one end and skylights overhead. A smaller room, 29 by 34 feet, will provide accommodations for meetings of the students' agricultural society.

The Missouri State legislature in 1901 appropriated $40,000 for a dairy and live-stock building. It was subsequently decided, however, to erect two separate buildings instead of combining all in one.

The dairy building (Pl. I, fig. 2) is 45 by 150 feet, and two stories in height, with cheese-curing rooms in the basement. It is built of crystalline limestone, with a slate roof. It contains on the first floor (fig. 4) all of the operating rooms, viz, a creamery room 40 by 51 feet in the clear, which will accommodate 7 power separators, the necessary ripening vats, pasteurizers, churns, butter workers, printers, etc.; a cheese room, at present 40 by 42 feet, and a farm dairy room 22 by 40 feet. The partition between the cheese room and the farm dairy room is temporary and may be removed at any time without defacing the building or in any way interfering with the stability of the structure, so as to

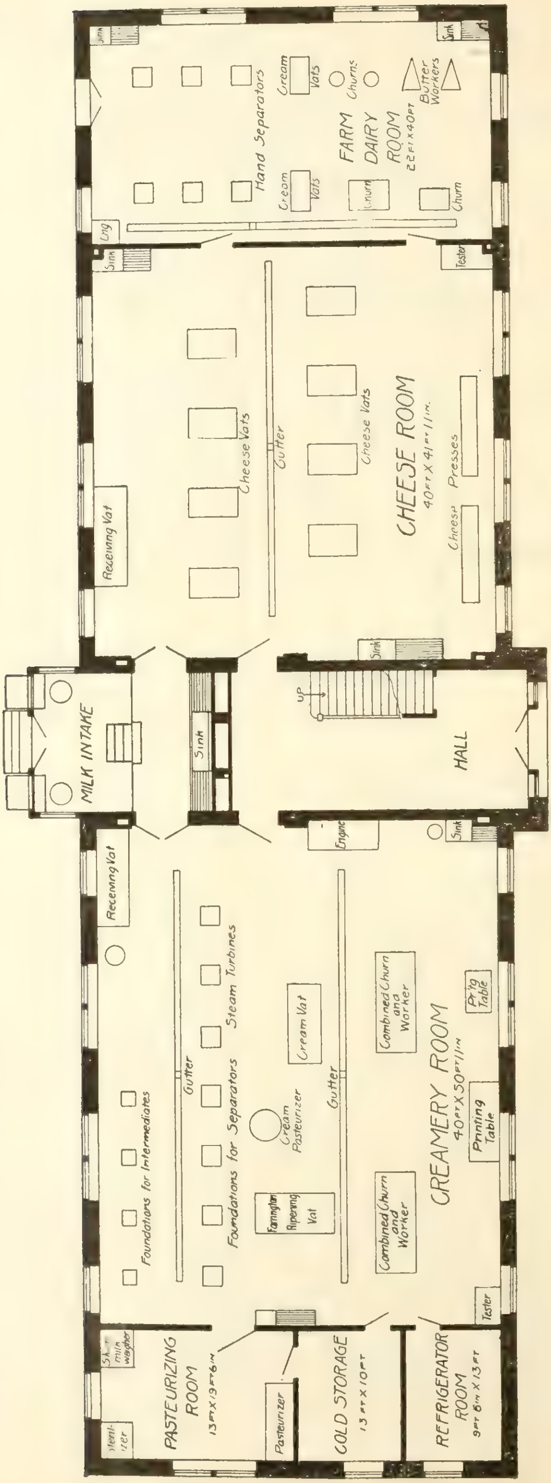


FIG. 4.—Missouri dairy building—plan of first floor.

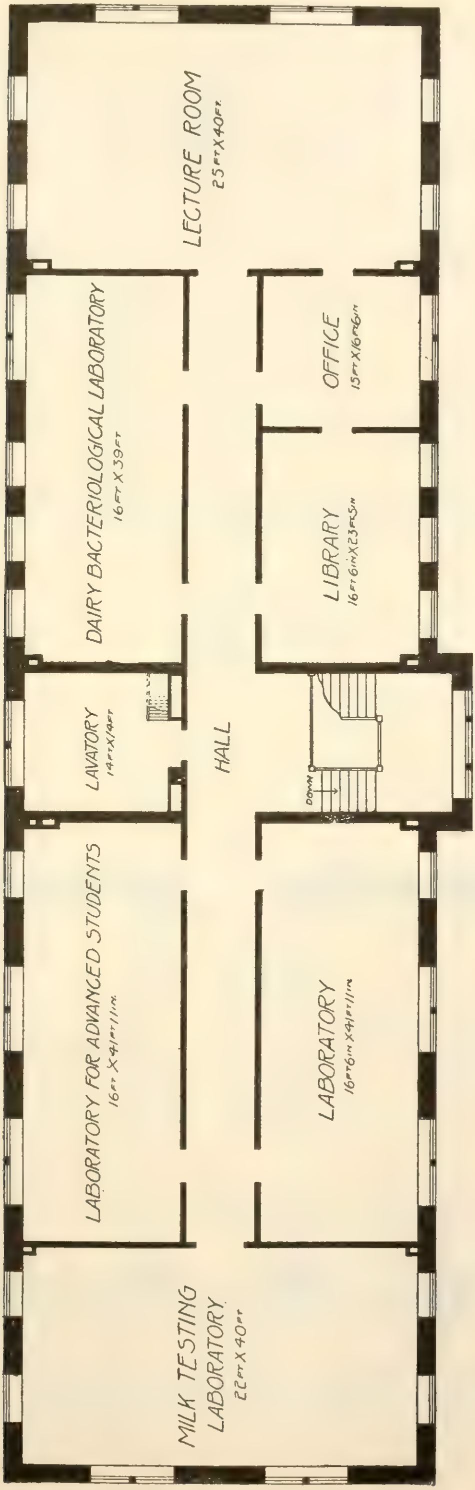


FIG. 5.—Missouri dairy building—plan of second floor.

give a cheese room 40 by 64 feet, if the work in this line should expand enough to require it. On the same floor is a pasteurizing room, 13 by 19½ feet, for instruction in bottling and the handling of milk for city trade; and two cold-storage chambers where different temperatures may be maintained for the keeping of butter and the curing of cheese. The milk is delivered at the center of the building in the rear, flows by gravity from the weigh can to the receiving vat in the creamery

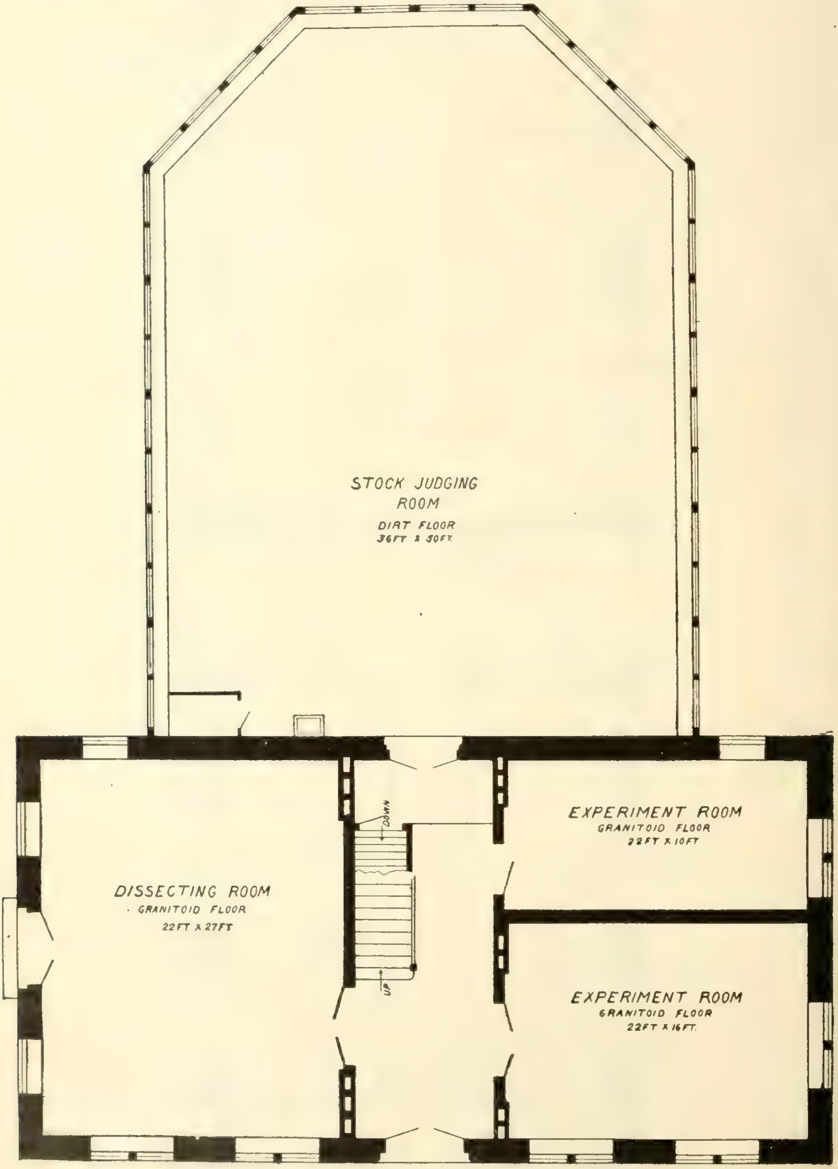


FIG. 6.—Missouri live-stock building—plan of first floor.

room or the cheese room, as may be desired, and from that point is pumped to the separators or the cheese vats.

The second floor (fig. 5) contains four laboratories, a lecture room which will accommodate 100 students, an office for the professor in charge, and a library and reading room where the dairy library of the university will be kept. All the laboratories have north and east light with the exception of one milk-testing room.

The building is heated by the indirect method from steam coils in the basement, with a fan to force the warm air through the building and insure complete ventilation.

The live-stock building is designed to afford a class room, laboratories, and breeding room, and a judging pavilion for instruction in live stock. The veterinary department will use the laboratories and a part of the animal rooms temporarily, but the legislature has made an appropriation of $15,000 for a hospital for the veterinary department, and a bill is now pending for $50,000 for veterinary laboratories, so that there is every probability that the entire building can be turned over to the animal husbandry department at an early date.

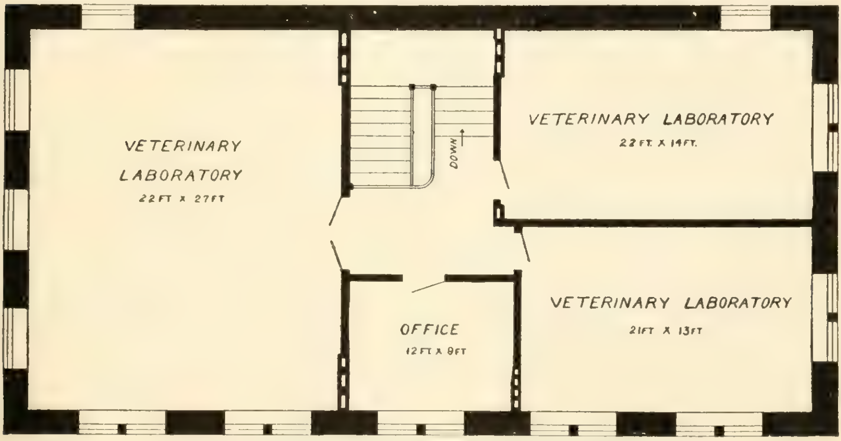


FIG. 7.—Missouri live-stock building—plan of second floor.

The first floor (fig. 6) contains at present a dissecting room 22 by 27 feet, and two experimental animal rooms, one 22 by 16 and one 22 by 10 feet, and a judging pavilion 36 by 50 feet. The judging pavilion will accommodate a class of forty students with ten animals.

The second floor (fig. 7) contains three veterinary laboratories—one 22 by 27 feet, another 21 by 13 feet, and another 22 by 14 feet, and an office. These rooms will ultimately be used for class rooms and laboratories for animal husbandry, when they are vacated by the veterinary department.

This is a stone structure covered with slate and heated by the indirect method, like the dairy building.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

A new gravimetric and gasometric modification of the molybdic method for the determination of phosphoric acid and magnesia, E. Riegler (*Ztschr. Analyt. Chem., 41 (1902), No. 11, pp. 675–686, fig. 1*).—The gravimetric method for phosphoric acid rests upon the fact that barium chlorid produces in an ammoniacal solution of ammonium phosphomolybdate a precipitate, perfectly insoluble in water, containing 1.75 per cent of phosphoric anhydrid and 45.5 per cent of barium, corresponding to to the formula $Ba_{27}(MoO_4)_{24}P_2O_8 + 24H_2O$. The weight of the precipitate, dried at 100° C. multiplied by 0.0175, gives the weight of phosphoric anhydrid. In the gasometric method an excess of barium chlorid is added and this excess determined by conversion into iodate by addition of hydrociodic acid, the iodate being decomposed by addition of hydrazin sulphate with evolution of nitrogen, which is measured and furnishes a basis for calculating the excess of barium chlorid. This subtracted from the total amount of chlorid used gives the amount required for precipitation. The 2 methods may be used on the same portion of the original solution and thus serve as a check on each other. They were found to give very concordant results in a number of tests. A table containing factors for correcting results for different barometric pressures and temperatures is given and the apparatus used is described. For determination of magnesia this substance is first precipitated as ammonium-magnesium phosphate, which is dissolved in nitric acid and precipitated as ammonium phosphomolybdate, the further treatment being the same as that just described.

Determination of phosphoric acid in fertilizers, A. G. Woodman (*Engineer. and Mining Jour., 74 (1902), p. 781; abs. in Chem. Ztg., 27 (1903), No. 3, Repert., p. 5*).—In the method described 2 gm. of substance is heated in a covered beaker with 10 cc. each of strong hydrochloric acid and water and 1 to 2 gm. of sodium chlorate until the chlorin is driven off. The volume is made to 250 cc., and to 25 cc. of this solution in an Erlenmeyer flask 15 cc. of ammonia (0.9 sp. gr.) is added and neutralized with strong nitric acid. The solution is heated to 65° C., and 25 to 75 cc. of ammonium molybdate is added, shaking vigorously. The precipitate, which settles quickly, is collected on a filter and washed. The filter and contents are returned to the Erlenmeyer flask and standard potash solution added until the precipitate is almost dissolved. Phenolphthalein is added and the addition of the potash solution is continued until the color remains for 1 minute. If the potash solution used consists of 323.81 cc. of normal solution diluted to 1 liter, each cubic centimeter corresponds to 1 mg. of phosphoric acid.

The valuation of Thomas slag, B. Sjollema (*Jour. Landw., 50 (1902), No. 4, pp. 367–370*). Phosphoric acid was determined in a sample of Thomas slag by treatment with (1) strong nitric acid, (2) Wagner's method, and (3) repeated extraction with 2 per cent citric acid. In the latter case the slag was (1) shaken in a flask with successive portions of 150 cc. of acid, allowed to stand some hours, and the solution filtered, and (2) mixed with sand, placed in a tube, and washed with the acid. Two liters of citric acid was used in each case. The repeated extractions gave results agreeing quite closely with those furnished by the mineral acid extraction, but considerably higher than those given by the Wagner method.

On the determination of citric-acid soluble phosphoric acid, M. Passon (*Chem. Ztg., 27 (1903), No. 4, p. 33*).—The author describes a slight modification of the oxidation method of Passon and Mach.[a]

Transformation of pyrophosphoric acid into orthophosphoric acid, H. Grian (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 22, pp. 961–963*).

On the determination of calcium in the form of oxalate, V. Paguiref (*Zhur. Russ. Fiz. Khim. Obshch., 34 (1902), No. 2, pp. 195–199; abs. in Bul. Soc. Chim. Paris, 3. ser., 30 (1903), No. 1, p. 95*).—In order to obtain a precipitate which will not run through the filter the author adds to a neutral solution of calcium salt in the cold an excess of oxalic acid, stirring the solution at the same time; then ammonia, drop by drop, until a slightly alkaline reaction is obtained. The solution is heated and stirred continuously to drive off the excess of ammonia. The precipitate thus obtained is of the same composition as that obtained by the ordinary method, but is more compact, settles completely in less than 4 hours, and does not pass through the filter.

A rapid gravimetric method of estimating lime, F. B. Guthrie and C. R. Baker (*Agr. Gaz. New South Wales, 13 (1902), No. 12, pp. 1215, 1216*).—Lime is precipitated as oxalate and reduced to oxid by ignition in a platinum crucible with ammonium nitrate. The crucible is placed in a slanting position and partly covered with the lid. Heat (from a Bunsen burner) is applied to the lid until danger of spurting is passed, when the crucible is heated directly for about 5 minutes.

On the determination of free lime in Thomas slag, M. Bischoff (*Chem. Ztg., 27 (1903), No. 4, p. 33*).—Comparative tests of Scheibler's sugar-solution method and extraction with water are reported. The first gave much higher results than the second, but it was found that on boiling the sugar-solution extract a precipitate of calcium carbonate was obtained, showing that the sugar-solution extracts carbonate as well as free lime. For this reason the extraction with water is considered the more reliable method.

Lime determinations by means of Passon's apparatus, M. Passon (*Deut. Landw. Presse, 30 (1903), No. 4, pp. 26, 27*).—It is stated that the determinations by means of the apparatus are too high when large amounts of sand, clay, etc., are present. A table of corrections to be used is given.

Passon's lime test, T. Pfeiffer (*Deut. Landw. Presse, 30 (1903), No. 6, p. 44*).—Reports results of tests which indicate the unreliability of the method, even with corrections applied as suggested by the author. (See above.)

On the determination of perchlorates, M. Hönig (*Chem. Ztg., 27 (1903), No. 4, pp. 32, 33*).—The author fuses the salt containing perchlorate with iron filings in a nickel crucible. This reduces the perchlorate to chlorid, which is determined gravimetrically.

A titration method of determining hardness of water by means of aqueous soap solutions, A. Gawalowski (*Ztschr. Analyt. Chem., 41 (1902), No. 12, pp. 748–752, figs. 2*).—Water solutions (1 cc. corresponding to 0.0012 gm. CaO) of neutral sodium oleate or of commercial soap made of soda and cocoanut oil are recommended. The method of titration is practically the same as that usually employed, except that green glass flasks marked at 25, 50, 75, and 100 cc., for use with waters of different degrees of hardness, are employed, and a small amount of carmine tincture is added to assist in defining more clearly the point of saturation.

A volumetric method for the determination of tannin and the analysis of tanning materials and extracts, A. Thompson (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 17, pp. 689–691*).

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[a] Ztschr. Angew. Chem., 1896, p. 129

A method for the determination of glycerin in wine, A. TRILLAT (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 21, pp. 903–905*).

On albuminoid substance extracted from maize seed, E. DONARD and H. LABBÉ (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 18, pp. 744–746*).—The method of preparation and the chemical properties of a maize proteid, "mazaïne," are here described, and an elementary analysis reported. The author states that corn contains 4 to 4.5 per cent of this proteid.

On musculamine, a new derivative from muscles, A. ETARD and A. VILA (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 17, pp. 698–700*).—A brief note describing a base prepared from muscular tissue for which the name "musculamine" is proposed.

Experiments with Wollny's refractometer for milk analysis, S. HALS (*Aarsbr. Offent. Foranstalt. Landbr. Fremme, 1901, pp. 402–409*).—The Wollny refractometer was compared with the Adams method for the analysis of fresh milk, gravity and separator skim milk, watered milk, and adulterated milk of various kinds, in a study of the applicability of the refractometer in milk control stations. It was found that the results with the Wollny refractometer were more accurate than those obtained with the Gerber butyrometric method, and as a rule differed from the gravimetric results by less than 0.1 per cent. Owing to the great care required in the manipulation of the method, the many different steps, the expense of the reagents, etc., the refractometer is not recommended in preference to the Gerber method in milk analysis where a large number of samples are to be tested daily, as, for example, at milk control stations.—F. W. WOLL.

Proceedings of the first annual meeting of the Association of German Food Chemists (*Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 21, pp. 993–1111*).—Among the subjects considered at the meeting, which was held at Eisenach in August, 1902, were the examination of Italian pastes and similar materials, the detection of margarin in butter, the detection of fluorin in plants, quantitative examination of aqueous solutions by the immersion refractometer, the quantity and determination of boric acid in plants, the direct gravimetric determination of boric acid in foods, lactic acid in wine, the lecithin content of fats, weed seeds, especially cockle, in meal, and changes in beeswax due to bleaching with chemicals.

Synopsis for use in analysis and examination of preserved foods, etc., C. MANGET (*Tableaux synoptiques pour l'analyse des conserves alimentaires. Paris: J. B. Baillière & Sons, 1902, pp. 88, figs. 13, dgms. 2*).—Tabular statements are given for guidance in the analysis and examination of preserved meats, lard, milk, etc.

Report of the Chemical Control Station, Trondhjem, Norway, 1901, T. SOLBERG (*Aarsbr. Offent. Foranstalt. Landbr. Fremme, 1901, pp. 220–254*).—The total number of samples examined at the station during the year was 873, including feeding stuffs, fertilizers, soils, and foods. The results of the analyses are given and discussed. Accounts are also embodied in the report of 7 different series of fertilizer experiments on farms located in the vicinity of Trondhjem.—F. W. WOLL.

Annual report of the progress in agricultural chemistry, 1901, A. HILGER, T. DIETRICH, ET AL. (*Jahresber. Agr. Chem., 3. ser., 4 (1901), pp. XXXVIII + 613*).—This contains abstracts of the more important articles in agricultural chemistry published in 1901 and titles of articles of less importance. The subjects are classified under plant production, animal production, agricultural technology, and methods of investigation.

Annual report of the progress in chemistry and related parts of other sciences, 1894, G. BODLÄNDER, W. KERP, G. MINUNNI, ET AL. (*Jahresber. Fortschr. Chem., 1894, Nos. 1–9, pp. 2848*).—This volume, published in 1902, contains abstracts of literature of chemistry and related subjects, with classified table of contents and author and subject indexes.

BOTANY.

The effect of sunshine on plants, N. PASSERINI (*Bul. Soc. Bot. Ital., 1902, pp. 13–24; abs. in Jour. Roy. Micros. Soc.* [*London*], *1902, No. 5, p. 574*).—The results of growing 13 different species of plants in direct sunlight and in diffused light are shown. By analyses the author determined the relative percentages of water, organic matter, and ash of the 2 sets of plants. The highest gain was found in a gourd where the plant grown in sunshine was 27 times heavier than the shaded plant. Next to this in gains were barley and maize, the difference in each case being about 9 times as great for the plants grown in the sunlight as in the shade. The greatest gain in organic substance was shown by rape, barley, and pimpernel. The conclusions drawn by the author are that in every case the plant exposed to direct sunlight is heavier than the shaded plant, and that the failure of direct radiation limits the growth of the plant and retards its vegetative phases, especially the inflorescence and the complete development of the fruit. Plants grown in direct sunshine are much greener than the shaded plants, and the shaded plants have a larger proportion of water and less solid substance. The higher percentage of solids in the sun-grown plants is chiefly due to the organic matter, the difference in the proportion of mineral matter being less noticeable.

Influence of X-rays on plants, H. SECKT (*Ber. Deut. Bot. Gesell., 20* (*1902*), *No. 2, pp. 87–93; abs. in Jour. Roy. Micros. Soc.* [*London*], *1902, No. 4, p. 455*).—The author found that the exposure to X-rays distinctly favored the streaming movement of protoplasm and the leaf movements of Mimosa and Oxalis. After from 15 to 45 minutes' exposure to these rays movements which before had been very slow became quite rapid. When the tube of the apparatus experimented with was placed too close to the object a greater or less tendency to plasmolysis was observed. This the author attributes to the harmful action of other electric waves.

Electrical phenomena in plants, A. TOMPA (*Bot. Centbl., Beihefte, 12* (*1902*), *pp. 99–136, figs. 3; abs. in Jour. Roy. Micros. Soc.* [*London*], *1902, No. 5, p. 574*).—There was found to be no essential difference of intensity in manifestation of electric polarization in living and dead seeds. The polarization currents in both dead and living seeds may reach considerable intensity but are of small tension. The amount, intensity, and the direction of the current vary according to variations in the internal resistance of the seed. It is claimed that the question of living seeds may be determined by what are termed lesion currents. A lesion current whose potential exceeds 0.005 volt may be considered as a criterion of life in a seed.

Electric response in plants under mechanical stimulus, J. C. BOSE (*Jour. Linn. Soc.* [*London*], *Bot., 35* (*1902*), *pp. 275–304, figs. 25; abs. in Jour. Roy. Micros. Soc.* [*London*], *1902, No. 5, pp. 574, 575*).—The object of the author's experiments was to prove that plants and their different organs respond to electric stimuli in the same way that animal tissue responds, indicating that vital phenomena are identical in the animal and plant kingdoms. The responses are held to be physiological, since whatever influences the physiological activity of the plant also tends to increase or diminish the electric response. The author emphasizes the importance of this unity between plants and animals; and owing to the simpler conditions which obtain in plant life, the electro-physiological investigations in plants may be found to throw much light on this subject.

Concerning the respiration of injured leaves, N. DOROFEJEW (*Ber. Deut. Bot. Gesell., 20* (*1902*), *No. 7, pp. 396–402*).—By separating leaves from the plants bearing them and placing them under various conditions the author studied the effect of such separation and injury upon the respiration of the leaves. It was found that the carbohydrates present in the leaves influence their respiration to an important degree. If the carbohydrates are abundant there is but a slight increase in the respiration due to the wounding, while if the amount is small the respiration is greatly accelerated. This was found to be true both for green and etiolated plants.

Influence of irritation on the growth of unicellular plants, J. TRZEBINSKI (*Bul. Internat. Acad. Sci. Cracovie, 1902, pp. 112–130; abs. in Jour. Roy. Micros. Soc.* [*London*], *1902, No. 4, p. 471*).—A series of observations was made on the growth of *Phycomyces nitens* under the influence of various irritants. Mechanical injury was found to lower the turgescence and retard the growth of the hyphæ. Even very slight injuries were found to act to the detriment of the plant. The irritation of the sporangium by means of slender glass rods or similar agents caused an increase in the growth of the stalk. The vapor of ether induced a more rapid growth when present in an open vessel but if too condensed the growth was entirely stopped. The experiments are held to show a marked similarity between the higher and lower plants in response to various stimuli.

The permeability of protoplasm, VAN RYSSELBERGHE (*Rec. Inst. Bot. Univ. Bruxelles, 5* (*1902*), *pp. 209–249, pls. 6; abs. in Jour. Roy. Micros Soc.* [*London*], *1902, No. 4, p. 442*).—Observations are reported on the influence of temperature on the permeability of living protoplasm. The principal observations were on the contraction and expansion of living elder pith and of the epidermal cells of Tradescantia. It was found that the permeability of the protoplasm increased with the rise of temperature. At 30° C. the protoplasm was 8 times more permeable than at 0°. The permeability was found to be greatly reduced but not completely checked at 0° C., and this applied not only to the passage of water but also of substances held in solution. The passage of water was found to take place under greatly reduced osmotic pressures, and it is thought probable that there is no minimum force of filtration below which no passage of water takes place. It was further found that when the cell sap of the cell was isotonic with a certain solution at a given temperature it remained isotonic with the same solution at all temperatures, providing changes in the cell sap had not taken place by adaptation.

Predisposition and immunity in plants, H. MARSHALL WARD (*Proc. Camb. Phil. Soc., 11* (*1902*), *pp. 307–328; abs. in Jour. Roy. Micros. Soc.* [*London*], *1902, No. 4, p. 473*).—A discussion is given of the predisposition and immunity of certain plants to disease, based upon the author's investigations on the culture of rusts on brome grasses. His studies were confined to inoculation experiments with the uredospores of *Puccinia dispersa*, and the results obtained led to the conclusion that the source from which the spores are taken and the specific characteristics of the grass inoculated must both be taken into account if infections were successful. Certain species of grasses were readily infected by spores taken from individuals of the same species, but were immune to those of other brome grasses in an increasing degree as the species was further removed in its systematic relationship. It was found to be very difficult to inoculate plants from one specific group to another, and although the various characters of the plants were studied the conclusion was reached that the capacity for infection is due to some biological distinction and is wholly independent of the anatomical structure.

The origin of variegated varieties of plants, E. LAURENT (*Bul. Soc. Roy. Bot. Belg., 39* (*1900*), *II, pp. 6–9*).—According to the author, variegation is of 2 forms—(1) that which is produced from seeds and which may be attributed to some of the phenomena of fecundation, and (2) the variegation which appears in buds, generally designated as sports. An account is given of observations in a nursery in which variegated forms appeared of the common plum, quince, *Cerasus acida*, *Catalpa bignonioides*, *Ailanthus glandulosa*, *Populus canadensis*, and 2 varieties of elm. The variation noticed in these trees was that presented in the second category, viz, the occurrence of sports, and although the same trees were cultivated in neighboring nurseries and different parts of the same the variegation was noticed in only one particular region. It is believed that there must have been some substance present in the soil which was taken up by the roots and carried throughout the plants, affecting the distribution of the chlorophyll. This substance is believed to be some form of xymase and by the presence of this is to be explained the transmission of variegation by means of grafts and cuttings.

Experiments on cereal improvement at Olbersdorf, G. Swoboda (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 11, pp. 1272-1288*).—A detailed account is given of experiments which have been carried on at the station of Olbersdorf in the improvement of varieties of cereals. Spelts and oats were the subject of the improvement experiments, the object being to secure varieties better adapted to cultivation under conditions of elevation, temperature, etc., which prevail at that station. Potatoes were also experimented with, but are not reported upon in any detail.

The germination of potato tubers, H. Vöchting (*Bot. Ztg., 1. Abt., 60 (1902), No. 5, pp. 87–114, pls. 2; abs. in Jour. Roy. Micros. Soc.* [*London*], *1902, No. 4, p. 452*).—There was found to be a close correlation between the temperature and the manner of development of the shoots springing from potato tubers. At a temperature which only slightly exceeded the lower limit at which germination begins only tuber-bearing shoots were produced, while at the optimum temperature these shoots were exclusively developed. In the former case the root development of the plants was very small, while in the latter roots were abundantly developed. The amount of water in the soil was also found to be closely related to the mode of growth. If little or no water was present there was but slight development of roots, and no leaf shoots were formed, but only tubers. On the other hand, with a plentiful supply of water, numerous roots and leaf shoots appeared but no tubers. An increase in the supply of moisture in the air was found to favor the development of leaves on the shoots where only scales were formed in insufficient moisture. The amount of oxygen in the atmosphere was found to exert no appreciable influence during the course of germination.

Aleurone grains in oily seeds, B. Gram (*K. Danske Vidensk. Selsk. Skr., 6. ser., 9 (1901), pp. 303–336, pls. 4; abs. in Jour. Roy. Micros. Soc.* [*London*], *1902, No. 4, pp. 442, 443*).—The author has examined the character and reaction of the tegument, fundamental mass, globoid, crystal, etc., elements of oil-bearing seeds. The seed coat was found to be highly refractory. The fundamental mass consisted mainly of albuminoids which showed different degrees of solubility in dilute caustic potash for the different kinds of seed. In the globoid not only were the acid phosphates of calcium and magnesium found, but also succinic acid, and from their behavior with various solvents the globoids seemed to have a uniform composition. The investigations relating to the presence of alkaloids were of a negative character. From the crystals present succinic and oxalic acids and magnesium, calcium, and potassium were obtained. The difference in resistance of the crystals to different reagents is due to differences in their chemical composition. In most cases the author concludes that the crystalloids are of a very complex nature.

Enzyms of the tea leaf, H. H. Mann (*Jour. Asiatic Soc. Bengal, 70 (1901), II, No. 2, pp. 154–166*).—After briefly reviewing the chemistry and physiology of the tea leaf, the author gives an account of investigations on the enzyms which are found in the tea leaf and to which the character of the prepared tea is said to be due. It is said that an oxydase occurs in the leaf of the tea plant, and that this is the principal agent which causes fermentation and coloring of the leaf. It is most active at temperatures below 55° C., and is destroyed at a temperature of 80°. It occurs in greatest abundance in the unopen leaves at the tip of the shoot. The quantity decreases as the leaves grow older, but the leafstalks contain almost the same amount as the tip leaf. In leaves of the same general type those which contain the most of the enzym make the most highly flavored tea, and the increase in the enzym of the leaf seems to be related to the amount of phosphates in the soil. The amount of enzym in the leaf increases rapidly during the process of withering the leaves, a fact that makes it probable that this ferment performs much more important functions in the manufacture of tea than has hitherto been believed. Other enzyms were found to occur in the tea leaf, but as yet no evidence has been obtained to show that they are of great importance in tea manufacture.

Alinit, C. Schulze (*Centbl. Agr. Chem., 31 (1902), pp. 145–147; abs. in Jour. Roy. Micros. Soc. [London], 1902, No. 5, p. 603*).—The author states that the Alinit bacillus requires organic nitrogenous matter for its growth and fails to grow in nonnitrogenous solutions. Wheat was grown in pots containing Ellenbach soil and ground sandstone, which were divided into the series of sterilized, inoculated, and check. At the conclusion of the experiments it was found that although all the pots contained molds and various bacteria, the alinit bacillus predominated. No fixation of free nitrogen had taken place, but on the contrary there was a distinct loss of nitrogen. Similar results were obtained in pot experiments exposed to the air, and negative results were obtained in a set of experiments to determine the effects of carbohydrates as well as in field experiments of barley and oats.

Energy of assimilation in fungi, T. Bokorny (*Arch. Physiol. [Pflüger], 89 (1902), No. 9–10, pp. 454–474; abs. in Jour. Roy. Micros. Soc. [London], 1902, No. 5, p. 587*).—It was found that the assimilation energy measured by the relative increase in weight is much greater for molds and yeasts than for green plants. A mold grown in a medium containing glycerol and ammonium sulphate increased in weight 1,000 times in 28 days. Yeasts increased most rapidly in the presence of cane sugars when the nitrogenous food present was peptone. Asparagin is said to be less favorable, and ammonium sulphate least of all. Spirogyra is said to be able to assimilate its carbon from sodium formaldehyde sulphonate in the absence of carbon dioxid, starch being formed in the cells. In 5 days 0.07 gm. of a dried plant produced 0.11 mg. of starch.

Resistance of molds to metallic poisons, C. Pulst (*Jahrb. Wiss. Bot. [Pringsheim], 37 (1902), No. 2, pp. 205–263; abs. in Jour. Roy. Micros. Soc. [London], 1902, No. 4, p. 472*).—Cultures were made of *Mucor mucedo*, *Aspergillus niger*, *Botrytis cinerea*, and *Penicillium glaucum* to test the effect of metallic poisons upon their development. The sulphates of copper, zinc, iron, etc., were mixed with the substratum upon which the molds were grown, and the effect noted upon the subsequent development. The results showed that *Penicillium glaucum* possessed the greatest power of resistance, and the other 3 were extremely sensitive to the influence of metallic poisons. It was further found that molds, particularly Penicillium, have the power of accommodating themselves to the medium in which they are grown, and the limit of resistance rises with each generation of the fungus.

The influence of a medium on the respiration of molds, S. Kostytschew (*Ber. Deut. Bot. Gesell., 20 (1902), No. 6, pp. 327–334*).—Experiments are reported with *Mucor stolonifer* and *Aspergillus niger* in which the author sought to ascertain whether there was any relation between the intramolecular respiration of these molds and the alcoholic fermentation of yeasts. The molds were grown upon various media in an atmosphere free from oxygen, and the effect of different substances as influencing the respiration is shown. There was no evidence found to indicate that intramolecular respiration and alcoholic fermentation are identical.

A few common fleshy fungi of Ames, Alice W. Hess (*Iowa Sta. Bul. 61, pp. 148–153, figs. 5*).—Descriptive notes are given on a number of fungi, among them *Coprinus micaceous*, *Morchella esculenta*, *Pleurotus ostreatus*, *P. sapidus*, and *P ulmarius*, also *Agaricus campestris*, *Lycoperdon giganteum*, and *Lepiota morgani*. This last species is considered by many to be poisonous, although, according to the author, it has been eaten without injury by a number of individuals.

New species of fungi from various localities, J. B. Ellis and E. Bartholomew (*Jour. Mycol., 8 (1902), No. 64, pp. 173–178*).—Descriptions are given of about 2 dozen new species of fungi, most of which are saprophytic, but a few are said to occur parasitically on living leaves and other parts of plants of economic value.

A monstrosity of Boletus luteus, C. Van Bambeke (*Bul. Soc. Roy. Bot. Belg., 39 (1900), I, pp. 7–21, pl. 1*).—An account is given of an unusual form of *Boletus luteus* which is caused by the parasitism of the fungus *Hypomyces chrysospermus*.

Report of the New York State botanist, C. H. PECK (*Bul. New York State Mus., 10* (*1901*), *No. 54, pp. 931–984, pls. 7*).—Lists are given of the plants added to the herbarium during the year covered by the report, together with notes on species not hitherto reported as occurring within the State; also descriptions of new species and remarks and observations on old species. A number of species of edible fungi are described in detail, and illustrated by colored plates.

Report of the botanist, F. M. BAILEY (*Queensland Agr. Jour., 11* (*1902*), *No. 6, pp. 401–403*).—A summary is given of the activity of the botanist during the season covered by the report, and particular attention called to the numerous requests for the identification of suspected poisonous plants. On account of the prevailing drought resulting in a scarcity of food, stock has browsed upon many plants which in ordinary seasons would not have been touched. This has led to many suspected cases of poisoning. In some instances the plants have been found of a poisonous character, but the really injurious ones have been few in number.

FERMENTATION—BACTERIOLOGY.

Bacteriological investigations of the Ames sewage-disposal plant, L. H. PAMMEL (*Centbl. Bakt. u. Par., 2. Abt., 9* (*1902*), *No. 3–4, pp. 89–107, pls. 3*).—A description is given of the sewage-disposal plant at Ames, Iowa, and of the results of bacteriological studies. The number of bacteria per cubic centimeter is reported for the different months, and the daily variation is shown in tabular form. No attempt was made to identify all species of bacteria found in the effluent, although *Bacillus liquefaciens fluorescens* and *B. mutabilis* and several species of Sarcina were found quite commonly. Chemical analyses are reported of samples of water taken from time to time, which tend to show the uniformly high efficiency which the plant has attained, particularly in the consumption of albuminoid ammonia, etc. The bacteriological results show that all but an insignificant part of the bacteria are removed by this sewage-disposal plant, the degree of purification ranging from 99 to 99.55 per cent.

Bacteriological studies at the Lawrence experiment station, S. DEM. GAGE (*Massachusetts State Bd. Health Rpt. 1901, pp. 397–420*).—A number of papers are given in which changes are suggested in the methods for the eradication of *Bacillus coli* in water, and a review given of *B. coli* studies, as well as on methods for the differentiation of bacteria. A proposed system of classification of bacteria is described, and technical descriptions given of a number of species of bacteria which have been isolated during the routine studies of the station.

The penetration of plant tissues by bacteria, G. ELLRODT (*Centbl. Bakt. u. Par., 2. Abt., 9* (*1902*), *No. 17–18, pp. 639–642*).—On account of the reputed possibility of the transmission o bacterial diseases of man and animals through eating uncooked vegetable matter that had been grown in infested soils, the author studied a number of plants in pots watered with exceptionally active cultures of *Bacterium pyocyaneum*. Oats, beans, vetches, peas, violets, peonies, and iris were experimented with. The plants were grown until well established, after which the bacterial cultures were added to the soil. After a further period of growth the plant tissues were examined for bacteria. Although the bacteria were found to grow in the soil, none was found in the tissues of the plants experimented with so long as their roots remained uninjured. This seems to indicate that at least this species of bacteria is not able to penetrate the root tissues and thereby get into the above-ground parts of plants.

Assimilation of free nitrogen by bacteria, M. W. BEIJERINCK and A. VAN DELDEN (*Centbl. Bakt. u. Par., 2. Abt., 9* (*1902*), *No. 1–2, pp. 3–43*).—Studies are reported on the ability of a number of bacteria to assimilate free atmospheric nitrogen, the authors investigating various forms of Chroococcus in particular. These organisms were cultivated in nutrient media as pure cultures, pasteurized cultures, and mixed cultures, and the power of nitrogen assimilation shown. The amount of nitrogen added by the organisms to the media varied considerably, especially with the mixed cultures, the limits being from 0.73 to 6.93 mg. per gram of glucose or mannite in the solution. In the pasteurized cultures the range of variation was from 0.17 to 4.93 mg., while in the pure cultures or combinations of known species the range was from 0 to 5.91 mg. per gram of glucose or mannite. The possibility of symbiosis between forms of Chroococcus and other organisms was not proved.

Observations on the conditions of light production in luminous bacteria, R. E. B. McKenney (*Proc. Biol. Soc. Washington, 15 (1902), pp. 213–234, fig. 1*).—A study is reported of a number of so-called phosphorescent bacteria in which the author investigated their culture and the effect of various agents upon their luminescence. It was found that all acids, as well as an excess of alkali, were injurious to light production. The temperature limits for light emission are within those necessary for growth. Exposures to temperatures above the growth maximum were highly injurious to the power of light production, while exposure to low temperatures seemed to serve as a stimulus to light production. There was no luminescence at or below 0° C. A certain degree of continued illumination was found without effect, and it is possible for the bacteria to pass their entire lives in the dark and yet emit a brilliant light. Ether acts as a narcotic, preventing luminescence but not growth. Peptone or a related protein was found requisite for the nutrition of luminous bacteria, and either sodium or magnesium is required for growth and especially for light production. Potassium, ammonium, calcium, etc., can not replace sodium or magnesium. The author believes that luminescence is connected with metabolism, and since its appearance is closely followed by the presence of the culture liquid of the products of protein decomposition it is believed to be a phase of destructive metabolism.

The strawberry bacillus, W. Eichholz (*Centbl. Bakt. u. Par., 2. Abt., 9 (1902), No. 11–12, pp. 425–428, figs. 2*).—A description is given of the growth and morphological characters of the so-called strawberry bacillus on a number of different culture media.

A review of existing methods for cultivating anaerobic bacteria, O. F. Hunziker (*Reprint from Jour. Appl. Micros. and Lab. Methods, Vol. 5, Nos. 3, pp. 1694–1697; 4, pp. 1741–1758; 5, pp. 1800–1814; 6, pp. 1854–1856*).—The author presents an elaborate discussion of the literature of this subject in connection with an extensive bibliography. The methods for producing anaerobic conditions which are discussed in the article include the formation of a vacuum, replacement of air by inert gases, absorption of oxygen, reduction of oxygen, exclusion of atmospheric oxygen by means of various physical and mechanical devices, and the combined application of 2 or more of these methods. Special attention is given to methods of cultivating the bacilli of tetanus and anthrax.

Investigations on the physiology and morphology of alcoholic ferments, E. C. Hansen (*Compt. Rend. Travaux Lab. Carlsberg, 5 (1902), No. 2, pp. 64–67, figs. 2*). An account is given of the spore formation of certain species of Saccharomyces.

Comparative investigations on the condition of growth and reproduction of yeasts, etc., E. C. Hansen (*Compt. Rend. Travaux Lab. Carlsberg, 5 (1902), No. 2, pp. 68–107, figs. 4*).—The author has investigated the conditions for the vegetative growth and development of the organs of reproduction in yeasts and other alcoholic ferments. Recent investigations regarding budding, spore formation, and the relation between budding and spore formation, are given, and the effect of temperature on these factors is shown. As a rule the maximum temperature for the vegetative growth of Saccharomycetes was found to be higher than that for the formation of spores.

The influence of external factors on the assimilation of yeasts, T. Bokorny (*Centbl. Bakt. u. Par., 2. Abt., 9 (1902), Nos. 1–2, pp. 55–62; 3–4, pp. 117–126, fig. 1*).—The concentration of the culture medium, action of poisons like formalin, alkaloids, etc., the presence of acids beyond a very weak concentration, and of alcohol in a concentration of more than 5 per cent, were found to check the assimilative action of yeasts. It was found that like green plants the variation of temperature played an important part, the maximum assimilation taking place at 20 to 25° C., while at 40° it was checked and at 20° was nearly at the minimum.

The Benikoji fungus, Y. Uyeda (*Bot. Mag.* [*Tokyo*], *15 (1901), pp. 160–163; 16 (1902), pp. 79, pl. 1; abs. in Jour. Roy. Micros. Soc.* [*London*], *1902, No. 4, p. 466*).—An account is given of the fungus used in making a Chinese fermented drink known as anchu from rice in Formosa. Several fungi were found to take part in the process, but the chief agent of fermentation was said to be a species of Monascus. In cultivation the fungus produces sporangia, which become reddish in color, surrounded by an envelope of loose hyphæ. The author believes the fungus is identical with *Monascus purpureus*, and besides this fungus there were 2 forms of yeast present. The yeast most frequently observed is believed to be nearly allied to *Saccharomyces rosaceus*.

AIR—WATER—SOILS.

On the question of hydrogen in the atmosphere, Lord Rayleigh (*Phil. Mag. and Jour. Sci., 6. ser., 3 (1902), No. 16, pp. 416–422*).—The results of spectroscopic observations and combustions with copper oxid are reported as a basis for the inference "that the free hydrogen in country air does not exceed 1/30,000 of the volume."

On atmospheric hydrogen, A. Leduc (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 20, pp. 860, 861*).—The results obtained by the author by means of direct determination of oxygen and calculation from various equations confirm those of Lord Rayleigh in indicating that the proportion of hydrogen in the atmosphere is much smaller than is claimed by Gautier, who reports about 1 cc. in 5 liters.

On the quantity of free hydrogen in the air and the density of atmospheric nitrogen, A. Gautier (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 23, pp. 1025–1032*).—A reply to the statements of Lord Rayleigh and Leduc, noted above.

Researches on the blue color of the sky, G. Zettwuch (*Phil. Mag. and Jour. Sci., 6. ser., 4 (1902), No. 20, pp. 199–202*).—This is an abstract of a thesis for the doctor of science degree of the University of Rome, which gives an historical review of the subject, its present status, and an account of experimental researches on the subject directed mainly toward the verification of Rayleigh's dynamical theory.

The chemical and geological history of the atmosphere, J. Stevenson (*Phil. Mag. and Jour. Sci., 6. ser., 4 (1902), No. 22, pp. 435–451*).—In a previous paper (E. S. R., 12, p. 426) the author stated the reasons for believing that the primitive atmosphere of the earth contained no free oxygen, but considerable quantities of hydrogen or hydrocarbon gases. The present paper discusses the extent and composition of the primitive atmosphere, the conclusion being "that the primitive atmosphere was most probably a very extensive one, perhaps a hundred or several hundred times greater in extent than our present atmosphere. It may have consisted principally of carbonic acid, or it may have contained, either in addition to or instead of carbonic acid, large quantities of hydrogen, hydrocarbon gases, and carbonic oxid. At present our information regarding the data bearing on this question is not definite enough to decide the point with certainty, but we may reasonably hope that sufficient evidence will sooner or later accumulate to give a fairly decisive verdict."

The climate and artesian waters of Australia, J. P. Thompson (*Queensland Geogr. Jour., n. ser., 17 (1902), No. 3, pp. 1–32*).—The sources of meteorological data relating to Australia are noted and its general climatic conditions, especially as regards rainfall, are discussed. The geological and physical characteristics of the great central artesian basin of Australia are discussed in detail. Among the conclusions reached are:

"That a comparatively small percentage of the rainfall over the interior of the continent is absorbed by the exposed marginal outcrops and carried to the retaining gravel beds that underlie the clays, and when these overlying impervious strata are pierced by the borer's drill, at lower levels than the source of supply, the impounded waters beneath the clayey strata flow to the surface.

"That from the elevated intake beds there is a very slow circulation of the underground waters toward the lower levels of the central portion of the continent, where there is leakage in the form of natural artesian springs and marshes—such being favored by the local conditions to which I have alluded.

"That, besides these natural springs at the bottom of the great central trough, there are others where weak portions of the strata occur within the region.

"That the great storage beds are periodically replenished by the quantity of water absorbed at the outcrops.

"That the absorbing process is temporarily suspended when the water-carrying beds have been filled.

"That there is upward as well as downward percolation of artesian water.

"That by far the greater portion of the rainfall over the inland regions of Australia and the leakage waters from the storage beds are evaporated.

"That there is no available evidence of submarine leakage of the artesian waters of Australia.

"That, on the contrary, the balance of evidence and of reasons is directly opposed to the theory of such leakage."

Chemical-geological investigations on the absorptive properties of decomposed rocks, M. DITTRICH (*Mitt. Grossherz. Bad. Geol. Landes-Aufnahme, 4, No. 3; abs. in Centbl. Agr. Chem., 31 (1902), No. 12, pp. 793–796*).—In these investigations 25 gm. of weathered rock (hornblende granite) was treated at room temperatures for 2 days with normal, $\frac{1}{10}$-normal, and $\frac{1}{100}$-normal solutions of sodium, potassium, ammonium, calcium, and magnesium chlorids; and potassium nitrate, sulphate, and carbonate, the composition of the extract thus obtained being determined. With tenth-normal sodium chlorid solution considerable amounts of lime and magnesia were dissolved, while an equivalent amount of soda was retained by the rock, and only traces of potash were found in the extract. These changes took place very soon after the solution was added, and with 8 days' digestion the results were the same as with 2. With the hundredth-normal solution the amount of lime dissolved was increased, while with normal solution it was decreased. With potassium chlorid solutions the reactions were much the same in kind as with sodium chlorid solutions and proceeded more rapidly. Despite the fact that the rock was already rich in potash, it absorbed considerable amounts of potash from the solution. The amounts of lime and magnesia dissolved were double those removed by the sodium chlorid solution. The behavior of ammonium chlorid solution was similar to that of potassium chlorid. In both cases there was apparently a chemical union of the base with the constituents of the rock. Little change was observed in case of the solutions of calcium and magnesium chlorids. Potassium nitrate and sulphate behaved like the chlorid, indicating that with neutral salts the reactions depend upon the base and not upon the acid. With calcium carbonate, an alkaline salt, almost no lime and magnesia were dissolved, but more than a third of the potash, with a corresponding amount of carbon dioxid, were absorbed by the rock.

Geology and water resources of the Snake River Plains of Idaho, I. C. RUSSELL (*U. S. Geol. Survey Bul. 199, pp. 192, pls. 25, figs. 6*).—This report is based on the results of field work carried on from July 5 to September 12, 1901, the main objects of which "were to ascertain how far the geological conditions, particularly beneath the broad lava-floored plains bordering Snake River, favor the hope of obtaining flowing water by drilling wells, and where test wells should be put down in order to determine the correctness of inferences based on geological and other conditions." Especial attention is given to the physiography and geology (including soils) of the region, which is described as "a generally flat area bordered by rugged mountains" extending "in a curved course concave to the north entirely across the southern portion of Idaho. The length of this belt measured along its medial line is about 350 miles, and the width is generally from 50 to 75 miles. Its area, as estimated by Lindgren, is 34,000 square miles. Snake River traverses this rudely crescent-shaped plain throughout its length in a great curve concave to the north, which has a radius of some 175 miles. In a far-reaching view the flat country through which the Snake River finds its way presents the broader features of a vast level-floored, stream-eroded valley. A nearer acquaintance, however, shows that it is a built-up plain, formed principally of lava sheets, and does not owe its major surface features to erosion. . . .

"The geological discussion of the Snake River Plains may be consistently divided into 2 portions, the first dealing with the older rocks which were upraised into mountains and deeply eroded before the partial filling of the Snake River Basin, and the second with the lacustral and stream deposits, lava sheets, etc., now forming the plains themselves. The former, in geological language, embraces mostly, if not entirely, paleozoic rocks; and the second, tertiary and recent rocks. Between the formation of these 2 great rock divisions there was a long interval, during which deep erosion and the development of a rugged topography took place. . . .

"The climate of the Snake River Plains has for its leading characteristics aridity, prevailing high temperatures in summer, and severe cold in winter. One of the most marked features in the atmospheric conditions at nearly all seasons is the great range in temperature between day and night. The mean annual precipitation is about 13 in., but many local variations occur. Nearly all the water that reaches the thirsty lands comes in winter and spring. During the growing season the soil is invariably parched, and successful agriculture without irrigation is seemingly impossible. . . . However, over the higher portion of the plains lying southwest of Big Butte the rainfall may be sufficiently above the average, or the soil may retain enough moisture, or possibly the slow melting of the winter snow may furnish the proper conditions to permit the growing of wheat and other cereals without irrigation. . . . As agriculture is at present entirely dependent on irrigation, cultivated land occurs only where water from streams and springs can be obtained. . . .

"In general the soil of the plains is a fine, yellowish-white, silt-like material, largely a dust deposit, which mantles the surface not only on level tracts but covers hills and broad depressions alike. This material is similar to the celebrated loess of China, except that it usually occurs as a comparatively thin layer, and resembles also the deposit bearing the same name in the Mississippi Valley. Like each of these formations, it is of exceptional fertility if properly irrigated. . . .

"The soils of southern Idaho are of 2 classes—sedentary and transported. Of the transported soils, there are again 2 principal subdivisions—wind-deposited and water-deposited. Of the wind-carried or æolian soils there are 2 principal varieties, one consisting mainly of fine quartz sand and the other of volcanic dust and lapilli. Of the water-deposited soils there are again 2 varieties—those laid down in lakes, principally in southwestern Idaho, and those deposited by streams. The principal part of the soil covering the plains at a distance from the mountains and outside the canyons is of æolian origin, and consists mainly of fine quartz particles."

It is stated that what are commonly termed alkali incrustations are absent from the soils of the region under normal conditions, although the occurrence of two chemically-formed subaerial deposits are described, one a white or yellowish-white deposit of carbonate of lime "found almost everywhere on the under sides of loose stones or in the upper portions of basaltic outcrops when covered with loose stones, sand, soil, etc.," and the other a deep-blue film consisting of salts of iron and manganese, occurring on the surface of the less recent lava.

The author concludes from his study of the water resources of the region that "the surface water supply at present available is largely wasted, and can by proper economy be made to yield 2 or 3 times the service now obtained from it." He believes "it is practicable to use for irrigation the entire summer flow of all the streams reaching the Snake River Plains." Another means of more fully utilizing the water supply is by constructing reservoirs, suitable sites for which have been located. There is evidence that the supply may be still further largely increased by the sinking of properly constructed artesian wells.

Studies on humus, T. SCHLOESING (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 16, pp. 601–605*).—Using methods similar to those employed in the study of the distribution of iron oxid in soils (E. S. R., 14, p. 18), the author found that in humus soils the proportion of organic matter adhering to the soil particles increases as the size of the particles decreases, i. e., from 0.4 per cent in the coarse sand particles to 5.4 per cent in the clay of one soil, and from 0.15 per cent in the coarse sand to 4.14 per cent in the clay of another. The method used in separating the different grades of particles is described. Potassium chlorid (5 gm. per liter) was successfully used to precipitate the clay particles without simultaneous precipitation of alkaline humates. The organic matter adhering to the particles was determined by combustion with copper oxid in the usual way, it being assumed in the calculation of the results that the organic matter contained 50 per cent carbon. The author advances the theory that the organic matter adhering to the soil particles has been precipitated upon them from the soil solutions and is alternately dissolved and precipitated as the soil solutions become diluted or concentrated. If this be true, it constitutes an important reserve or store of plant food.

A contribution to the study of tropical soils, J. D. KOBUS and T. MARR (*Jour. Landw., 50 (1902), No. 4, pp. 289–302*).—This article briefly discusses the value of chemical analysis as a means of determining the fertilizer requirements of soils, reviewing investigations on the subject, and reports the results of analyses of the solutions obtained by 5 successive extractions of 2 Javanese soils of volcanic origin with 2, 4, and 8 per cent hydrochloric acid, boiling for 2 hours, in each case, and by 24 hours extraction with cold concentrated hydrochloric acid. The proportion of solvent used was larger than that ordinarily employed. The author concludes that the 2 per cent acid extract gave results most accurately indicating the available potash and phosphoric acid of the soils.

Banana soils of Jamaica, II, H. H. COUSINS (*Bul. Dept. Agr. Jamaica, 1 (1903), No. 1, pp. 1–17*).—A preliminary analysis of some of the banana soils of Jamaica has been previously announced (E. S. R., 13, p. 633). The work has been continued, and in the present report physical and chemical analyses are given of about 30 of the most prominent banana soils of Jamaica. Fertilizer experiments were carried out on the soils examined. The results indicate that as a whole commercial fertilizers need not be used on Jamaica soils in the production of bananas for many years to come. The soil analyses, considered in the light of subsequent fertilizer experiments based on them, are believed to show that the analyses alone are sufficient evidence on which to base practical advice as to soils for banana cultivation.

Greensand marl, A. L. PARSONS (*Mineral Resources of the United States. Dept. Interior, U. S. Geol. Survey, 1901, pp. 823–827*).—This article briefly discusses the occurrence and classification of greensand formations and the production and use of the marls. Compiled analyses of characteristic marls from New Jersey, Maryland, and Virginia, and a bibliography are given.

Further contribution to the question, Can plant analysis show the fertilizer requirements of soils? C. VON SEELHORST, H. BEHN, and J. WILMS (*Jour.

Landw., *50* (*1902*), *No. 4*, *pp. 303–322*).—The article reviews recent contributions by other investigators to this subject, and reports a continuation of the experiments of the authors (E. S. R., 10, p. 1033). The conclusion is reached that the yield and composition of the plant substance is so influenced by meteorological conditions that plant analysis alone is of little practical value in determining the fertilizer requirements.

Root-tubercle bacteria in their relation to soils and fertilizers, Wohltmann and Bergené (*Jour. Landw.*, *50* (*1902*), *No. 4*, *pp. 377–395*).—Pot experiments are reported with peas on 11 different kinds of soils, one series of which was unfertilized and other series fertilized with ammonium nitrate, Thomas slag, and potassium phosphate. The composition of the soils and data regarding the development of root tubercles on the plants are reported in detail. The uncultivated soils were found to be poor in tubercle bacteria; a fair proportion of humus favored tubercle development, but there was little or no tubercle development in soils very rich in humus; excluding the moor soils, the nitrogen content appeared to be without influence on tubercle development; on all soils no tubercles were produced when ammonium nitrate was applied. Potash, phosphoric acid, and lime favored the production of root tubercles.

Bacteria of the soil in their relation to agriculture, F. D. Chester (*Pennsylvania Dept. Agr. Bul. 98*, *pp. 88*, *pls. 9*).—This is a summary of present information on this subject, to which is added an extended bibliography. (See also E. S. R., 10, p. 334; 11, p. 435; 12, p. 729; 14, p. 232.)

FERTILIZERS.

Fertilizers (*Twelfth Census United States, Census Rpts.*, *vol. 5* (*Agriculture, pt. 1*), *pp. CXXXVI–CXLII*).—This article discusses the history and the general theory of the use of fertilizers, in addition to giving statistics of use. The total expenditure for fertilizers in the United States in 1899 is given as $54,783,757, or $10 per farm, 7 cts. per acre of farm land, and 1.2 per cent of the total value of farm products. The expenditure was distributed as follows: North Atlantic States, $15,641,995; South Atlantic States, $22,732,670; North Central States, $7,273,695; South Central States, $6,711,824; Western States, $1,070,726; and Hawaii, $1,352,847. The outlay for fertilizers has, according to these figures, increased 42.4 per cent since 1890. "Of the farms classified by principal source of income, sugar farms reported expenditures greatly in excess of those of other farms. The average for all farms was only $10, while that for sugar farms was $280. The next largest expenditure was $69, for nurseries; florist's establishments expended $51; vegetable farms, $38; tobacco farms, $27; fruit farms, $22; rice farms, $13; and coffee, cotton, and dairy farms, $11. The lowest averages reported were $6 for hay and grain farms, and $5 for live stock and taro farms. . . . The average expenditure per acre was greatest for farms of cash and share tenants and least for farms of part owners and managers. The average per farm was greatest for farms of managers and least for those of part owners and share tenants. The percentage of the value of products expended for fertilizers was largest for farms of managers and least for those of part owners."

Analyses and valuations of fertilizers, L. A. Voorhees and J. P. Street (*New Jersey Stas. Bul. 163*, *pp. 55*).—This bulletin discusses the trade values of fertilizing ingredients in 1902; the cost, valuation, purchase, and guaranteed and actual composition of fertilizers, home mixtures, and special fertilizers; and reports the results of examination of 60 samples of standard unmixed fertilizing materials, 391 brands of complete fertilizers representing 95 manufacturers, 26 samples of ground bone, and 48 samples of miscellaneous products. In addition there are reported the analyses of 3 samples of home mixtures and 20 samples of mixtures especially compounded by manufacturers to order. The materials included, in addition to the mixed fertilizers, nitrate of soda, dried blood, dried and ground fish, tankage, superphosphates, muriate of potash, sulphate of potash, kainit, limekiln ashes, wood ashes, prepared lime, prepared lime and potash, oyster-shell lime, blue lime, tannery refuse, garbage ashes, oil-cake waste, wool waste, soot, bone residue, tobacco stems, and bat guano. About 31 per cent of the brands of fertilizers examined were deficient in one or more of the different forms of plant food. The averages for all brands of complete fertilizers examined during 1902 are as follows: Total nitrogen, 2.38 per cent; total phosphoric acid, 10.47 per cent; available phosphoric acid, 8.09 per cent; insoluble phosphoric acid, 2.38 per cent; potash, 5.32 per cent; station valuation, $21.32; selling price, $27.66. It appears "that the manufacturers are delivering, on the average, somewhat less total plant food than in 1901, at a slight advance per ton."

Analyses of commercial fertilizers, J. HAMILTON and W. FREAR (*Pennsylvania Dept. Agr. Bul. 101, pp. 137*).—A report on inspection of fertilizers in Pennsylvania during the six months ended July 31, 1902, including analyses of 450 samples with a discussion of the results and notes on valuation of fertilizers in 1902.

Commercial fertilizers, H. J. WHEELER ET AL. (*Rhode Island Sta. Bul. 89, pp. 53-66*).—This bulletin contains analyses of a portion of the fertilizers collected during 1902. The fertilizers examined during this year showed a very marked improvement over last year.

Analysis of commercial fertilizers (*South Carolina Sta. Bul. 73, pp. 14*).—This bulletin reports analyses and valuations of 175 samples of fertilizers collected during the season of 1901–2.

Should manure be plowed under as soon as it is carried to the field? T. REMY (*Deut. Landw. Presse, 30 (1903), No. 5, pp. 31, 32*).—Experiments with potatoes are reported which show that the best results, both as regards yield and starch content, were obtained when the manure was incorporated with the soil at once as compared with composting or allowing the manure to lie on the soil some time before being plowed under.

Comparative value of different phosphates, C. A. MOOERS (*Univ. Tennessee Record, 6 (1903), No. 1, pp. 20-24, figs. 4*).—This article discusses sources and nature of different phosphates and their relative value as fertilizers; reviews briefly previous experiments with phosphates; and gives results of pot tests at the Tennessee Station of superphosphates, precipitated phosphate, bone meal, and ground rock on cowpeas and turnips. The results with both crops showed no appreciable benefit from applications of from 300 to 1,200 lbs. of ground rock per acre. "On the other hand, 300 lbs. of high-grade acid phosphate gave a marked increase in the yield above any of the other plats." Finely ground bone meal gave excellent results. "For cowpeas 2 lbs. of phosphoric acid from the meal was found to be about equal to 1 lb. from acid phosphate. The turnips, however, seemed somewhat less able than the peas to use the phosphoric acid of the meal. Precipitated phosphate gave much better results than bone meal, and as would be expected the water-soluble phosphate of lime gave excellent returns, but whether the best, considering the quantity used, can not now be told."

What is the value of the water-insoluble phosphoric acid of double superphosphates? B. SCHULZE (*Deut. Landw. Presse, 30 (1903), No. 2, pp. 12, 13*).—Pot experiments with oats are reported in which phosphoric acid was applied, with and without the addition of lime, as superphosphate and in form of the residue from extraction of the water-soluble phosphoric acid from double superphosphate. The author concludes that the phosphoric acid of double superphosphate insoluble in water has usually one-third the fertilizing value of water-soluble phosphoric acid, which may be increased to one-half with cereals under favorable conditions and in case of phosphoric-acid hunger.

Phosphate rock, J. STRUTHERS (*Mineral Resources of the United States. Dept. Interior, U. S. Geol. Survey, 1901, pp. 811-822*).—Statistics of production in the United

States and the world, and prices and imports are given for a number of years. The total production in the United States in 1901 was 1,483,723 long tons, valued at $5,316,403, as compared with 1,491,216 tons, valued at $5,359,248, in 1900. Of the total United States product in 1901, 751,996 tons was furnished by Florida, 321,181 tons by South Carolina, 409,653 tons by Tennessee, and 893 tons by Pennsylvania. The production of the United States exceeds that of the rest of the world combined.

The Stassfurt industry (*New York: German Kali Works, 1902, pp. 65, figs. 29*).—This is a brief summary of information regarding the discovery and beginnings of mining of the Stassfurt potash deposits, the origin and formation of the deposits, methods of mining, character of the salts mined, methods of manufacturing the concentrated salts, production and consumption of potash salts, the use of potash in agriculture, and the salts used for fertilizing purposes. According to the statistics given, the total production of crude salts (carnallit, kieserit, sylvinit, kainit, and hartsalz) of the Stassfurt mines in 1901 was 3,484,694 metric tons (of 2,204 lbs. each), of which 1,438,579 tons was used directly as fertilizer and the remainder, 2,046,115 tons, was used in the manufacture of concentrated salts (muriate and sulphate of potash, sulphate of potash and magnesia, potash manure salt, and kieserit), the total production of which in 1901 was 426,561 tons. Of the total amount of actual potash (K_2O) produced in 1901, 270,826 tons was used in agriculture and 72,323 tons in other industries. Germany used for agricultural purposes in 1900 117,712 tons of actual potash. The amount used for the same purpose in the United States in 1899 was 52,667 tons.

Gypsum, J. Struthers (*Mineral Resources of the United States. Dept. Interior, U. S. Geol. Survey, 1901, pp. 843–851*).—Statistics of production in the United States and the world and of imports are given. A remarkable increase in the production of gypsum in the United States during recent years is reported. "The total production of gypsum in the United States during 1901 was 659,659 short tons, valued at $1,577,493, as compared with the total production during 1900 of 594,462 short tons, valued at $1,627,203, which shows an increase of 65,197 short tons in quantity and a decrease of $49,710 in value."

Yearbook on the use of commercial fertilizers, 1903, M. Ullmann (*Jahrbuch über die Anwendung künstlicher Düngemittel, 1903. Hamburg: J. H. Koch & Co., 1903, pp. 32, figs. 13*).—This contains a calendar and gives brief simple directions, applicable especially to German conditions, regarding the use of commercial fertilizers on various crops, based largely on the work of the experiment station of Hamburg-Horn, of which the author is director. There is also a brief discussion of the possibility of Germany becoming agriculturally self-sustaining.

Consumption of fertilizers (*Amer. Fert., 18 (1903), No. 1, pp. 10–15*).—This article gives data compiled from the last United States Census, and reported by State inspectors of fertilizers and Departments of Agriculture and from other sources.

FIELD CROPS.

Results obtained in 1902 from trial plats of grain, fodder corn, field roots, and potatoes, W. Saunders (*Canada Cent. Expt. Farm Bul. 41, pp. 61*)—This bulletin is the customary annual report of cooperative variety tests now in progress for 8 years at the Canada Experimental Farms (E. S. R., 13, p. 838). The yields of the different crops at the several farms are given in tables. The varieties producing the largest crops in 1902, taking the average results obtained on all the experimental farms and giving them in the order of their productiveness, were as follows:

Oats.—Siberian, Banner, Danish Island, Holstein Prolific, Golden Giant, Columbus, Golden Tartarian, Early Golden Prolific, New Zealand, Buckbee Illinois, Mennonite, and Tartar King. Average yield per acre, 78 bu. 17 lbs. *Two-rowed barley.*—Danish Chevalier, Canadian Thorpe, Kinver Chevalier, French Chevalier, Invincible, and Standwell. Average yield per acre, 50 bu. 12 lbs. *Six-rowed barley.*—Surprise, Odessa, Yale, Stella, Blue Long Head, and Brome. Average yield per acre, 53 bu. 23 lbs. *Spring wheat.*—Rio Grande, Roumanian, Colorado, Vernon, Goose, Preston, Plumper, Red Fern, Campbell White Chaff, Crown, Minnesota No. 181, and Herisson Bearded. Average yield per acre, 42 bu. 41 lbs. *Peas.*—Prince, Alma, White Wonder, Mackay, Arthur, Crown, Cooper, Harrison Glory, Agnes, Prince Albert, Pride, and Early Britain. Average yield per acre, 37 bu. 6 lbs. *Indian corn.*—Salzer All Gold, Thoro'bred White Flint, Early Butler, Eureka, Pride of the North, and Giant Prolific Ensilage. Average yield per acre, 19 tons 952 lbs. *Turnips.*—Good Luck, Magnum Bonum, Hall Westbury, Perfection Swede, Champion Purple Top, and Giant King. Average yield per acre, 30 tons 622 lbs. *Mangels.*—Lion Yellow Intermediate, Mammoth Long Red, Yellow Intermediate, Selected Yellow Globe, Mammoth Yellow Intermediate, and Champion Yellow Globe. Average yield per acre, 32 tons 714 lbs. *Carrots.*—Giant White Vosges, New White Intermediate, Iverson Champion, Green Top White Orthe, Improved Short White, and Mammoth White Intermediate. Average yield per acre, 23 tons 1,682 lbs. *Sugar beets.*—Royal Giant, Danish Improved, Danish Red Top, and Red Top Sugar. Average yield per acre, 24 tons 1,722 lbs. *Potatoes.*—Enormous, Irish Cobbler, Irish Daisy, Money Maker, Sharpe Seedling, Burnaby Seedling, Troy Seedling, Hale Champion, Dakota Red, Flemish Beauty, Rose No. 9, and Great Divide. Average yield per acre, 390 bu. 27 lbs.

The average results of the various crops for the last 3 to 8 years are also given. The following varieties, taking the average of the yields obtained on all the experimental farms, have been the most productive. *Oats.*—Banner, Danish Island, Mennonite, American Beauty, New Zealand, Holstein Prolific, Improved American, Black Beauty, Buckbee Illinois, Columbus, Thousand Dollar, and Golden Giant. Average yield per acre, 74 bu. 2 lbs. *Two-rowed barley.*—French Chevalier, Clifford, Dunham, Jarvis, Canadian Thorpe, and Harvey. Average yield per acre, 45 bu. *Six-rowed barley.*—Mensury, Claude, Mansfield, Odessa, Yale, and Trooper. Average yield per acre, 49 bu. 23 lbs. *Spring wheat.*—Roumanian, Laurel, Preston, Goose, Rio Grande, Monarch, Huron, Wellman Fife, Weldon, White Fife, Clyde, and Red Fife. Average yield per acre, 34 bu. 31 lbs. *Peas.*—Crown, Pride, Carleton, Picton, Early Britain, Chancellor, New Potter, Paragon, King, White Wonder, Pearl, and German White. Average yield per acre, 35 bu. 1 lb. *Indian corn.*—Early Mastodon, Salzer All Gold, Superior Fodder, Thoro'bred White Flint, Red Cob Ensilage, and Early Butler. Average yield per acre, 19 tons 887 lbs. *Turnips.*—Perfection Swede, Imperial Swede, Purple Top Swede, Halewood Bronze Top, Hall Westbury, and Bangholm Selected. Average yield per acre, 30 tons 1,267 lbs. *Mangels.*—Yellow Intermediate, Giant Yellow Intermediate, Lion Yellow Intermediate, Gate Post, Selected Mammoth Long Red, and Mammoth Long Red. Average yield per acre, 31 tons 292 lbs. *Carrots.*—New White Intermediate, Giant White Vosges, Half Long White, Improved Short White, Ontario Champion, and Mammoth White Intermediate. Average yield per acre, 22 tons 184 lbs. *Sugar beets.*—Danish Red Top, Danish Improved, Red Top Sugar, and Improved Imperial. Average yield per acre, 23 tons 1,383 lbs. *Potatoes.*—Uncle Sam, Irish Daisy, Seedling No. 7, American Wonder, American Giant, Seedling No. 230, Bovee, Country Gentleman, Rose No. 9, Late Puritan, Carman No. 1, and Seattle. Average yield per acre, 376 bu. 5 lbs.

"The evidence produced shows that there are great differences in the relative productiveness of varieties, when grown side by side under similar conditions, hence the importance to farmers of choosing for seed those which give the heaviest crops."

Report on the Cawnpore farm and other experiment stations in the United Provinces of Agra and Oudh 1902, W. H. MORELAND (*Dept. Land Records and Agr., Cawnpore Farm Rpt., 1902, pp. 1-18*).—The work here reported consisted of fertilizer experiments with wheat, corn, sugar cane, and potatoes, and variety and culture tests with cotton, sugar cane, and various cereal and forage crops. The results obtained are tabulated in detail and the yields with each crop briefly noted.

Field trials at the Agricultural College of Norway, 1901, B. R. LARSEN (*Ber. Norges Landbr. Hoiskoles Virks., 1901–2, pp. 255–298*).—This report contains detailed accounts of variety tests of winter rye, hay crops, potatoes, and roots, and of comparative trials of different kinds, quantities, and mixtures of barnyard manure on grass land. Attention is also called to the main practical results of experiments in crop production and methods of cultivation conducted by the author since the establishment of the department in 1889.—F. W. WOLL.

Cooperative fertilizer experiments in Sweden, 1901, P. BOLIN (*K. Landt. Akad. Handl. Tidskr., 41* (*1902*), *No. 3, pp. 137–279*).—The report of fertilizer experiments with cereals and root crops, conducted under the direction of the Swedish Agricultural Academy during 1901, is presented. The experiments, comprising 243 different series with a total of 6,556 plats, were conducted by 199 farmers located in 15 different counties. Owing to an exceedingly dry season, the results were not all conclusive, but some general deductions are made from the successful trials. Nitrogen was generally applied in the form of nitrate of soda and in some cases in the form of poudrette, fish guano, and barnyard manure. It is believed that the luxuriant growth induced by nitrogen fertilization counteracts to a certain extent the retarding influence of drought. For this purpose, however, the nitrogen must be sufficiently soluble to be utilized by crops even if the amount of moisture in the soil is very small. The results show that nitrate of soda was quite effective in this respect. For spring grains harrowing in the nitrate of soda immediately before or after sowing was found a much safer method than to use it for a top-dressing, in which case the action of the fertilizer is largely dependent on the precipitation. For winter grains the top-dressing with nitrate of soda is likely to give good results if applied in the early spring, when the surface of the soil is still moist.

The phosphatic fertilizers applied were 20 per cent superphosphate, Thomas phosphate, and steamed bone meal. In general, the superphosphate applied at the rate of 200 kg. per hectare, furnishing 37 kg. of water-soluble phosphoric acid, produced better results with spring grains than 400 kg. of Thomas phosphate with 60 kg. of citrate-soluble phosphoric acid. The opposite effect was observed in a limited number of experiments conducted with winter grains. The residual effects of Thomas phosphate seemed to be more marked than those of superphosphate. The author recommends Thomas phosphate for soils low in lime and containing considerable iron oxid. In most cases the effect of bone meal was considerably decreased on humus soils when lime was applied at the same time. Bone meal generally produced somewhat poorer results than Thomas phosphate, and was in almost every instance the more expensive fertilizer. Detailed descriptions of the different experiments as to the fertilizers applied, yields, and quality of the crops grown are given.—F. W. WOLL.

Fertilizer tests with kainit and Thomas slag, V. VON KNIRIM (*Selsk. Khoz. i Lyesov., 206* (*1902*), *Aug., pp. 401–426, Sept.; pp. 646–678; 207* (*1902*), *Oct., pp. 215–228*).—Tests with kainit and Thomas slag as fertilizers for rye, oats, barley, potatoes, clover, and grass were conducted by agricultural students under the direction of the author. From the results it is concluded that potash and Thomas slag are especially recommendable for clover fields and meadows; and that for spring cereals and potatoes they should be applied with superphosphate, and for winter cereals with superphosphate and bone meal. In the locality where these experiments were made the yields of clover, potatoes, and grasses are more easily increased than the yields of the cereals.—P. FIREMAN.

Rotation experiments, A. L. YAKOVLYEV (*Izv. Moscow Selsk. Khoz. Inst.* [*Ann. Inst. Agron. Moscou*], *8* (*1902*), *No. 3, pp. 225–244*).—The Norfolk, 3-course, and 18-course systems of crop rotation are under comparison. The 3-course and the Norfolk rotations represent extreme methods of extensive and intensive farming, respectively. The results indicate that by improved methods of cultivation the yields in the 3-course system may be increased 3 or even 4 fold.—P. FIREMAN.

Range improvement, J. J. THORNBER (*Arizona Sta. Rpt. 1902, pp. 261, 262*).—A brief outline is given of the work in range improvement as carried on by the station.

Hanna barley, A. CSERHÁTI (*Ztschr. Landw. Versuchsw. Oesterr., 5* (*1902*), *No. 10, pp. 1171–1207*).—Results of a series of cooperative variety and fertilizer experiments with Hanna barley in Hungary are given. It is concluded that this variety is the best for brewing purposes, and its wide and rapid distribution is regarded as bearing out this conclusion. The advantages of the variety consist in its early maturity and its greater productiveness and weight.

Experiments with cotton in 1902, G. P. FOADEN (*Jour. Khediv. Agr. Soc. and School Agr., 4* (*1902*), *No. 6, pp. 216–229*).—A report on fertilizer and rotation experiments with cotton, carried on at the experimental farms of the Khedivial Agricultural Society at Ghizeh and Mit-el-Diba in cooperation with many private farmers, is given, together with general directions for the culture of the crop. A comparison of commercial fertilizers with barnyard manure resulted in a marked financial benefit in favor of the barnyard manure. The use of superphosphate was found valuable, and the results of experiments favored the method of applying part of the total quantity before and the remainder after planting. Potash gave practically no increase in yield. An application approximating 400 lbs. of superphosphate and 100 lbs. each of nitrate of soda and sulphate of ammonia per acre gave the highest yield of cotton. In a rotation test cotton gave better results when grown after berseem than when following wheat.

Egyptian cotton, A. J. MCCLATCHIE (*Arizona Sta. Rpt. 1902, pp. 251, 252*).—In 1901 several varieties of Egyptian cotton were grown under irrigation. The yields per acre for the different varieties were as follows: Abbasi, seed cotton 1,580 lbs., lint 460 lbs.; Mitafifi, seed cotton 1,150 lbs., lint 275 lbs.; and Jannovich, seed cotton 500 lbs. The results thus far obtained indicate that Abbasi is the most profitable variety for the region and that it should be planted about the middle of March and given a moderate quantity of water with good cultivation.

Rotation and inoculation of leguminous crops, C. FRUWIRTH (*Ztschr. Landw. Versuchsw. Oesterr., 5* (*1902*), *No. 4, pp. 666–674*).—The results of rotation experiments with leguminous crops are reported. Clover and lupines gave better yields when grown after some other leguminous crop than when grown on soil which had not produced a crop of that class for a series of years. The results with vetch in this respect were not so marked. On soil which had produced a leguminous crop the year before, lupines gave the highest yield as compared with clover and vetch. Similar returns were obtained from a soil which had produced a leguminous crop for 2 successive years prior to these tests. Lupines gave the highest yield of seed after clover and the smallest yield, with the highest yield of straw, after vetch. The best yields of green fodder from vetch were obtained when this crop was grown after clover, while clover itself was most productive after lupines. Small yields were obtained where lupines, vetch, and clover were grown after beans.

It was found that growing lupines, flat peas, and garden beans for 2 years in succession on the same soil was advantageous to the second crop. Vetch after vetch and clover after clover was not beneficial, but this is not believed to be entirely due to the rotation.

Inoculating soil with the special bacterium for each of the leguminous crops grown gave increased yields.

Studies on the potato, E. BRÉAL (*Ann. Agron., 28* (*1902*), *No. 11, pp. 545–576, fig. 1*).—This article reviews important work on the potato by different investigators and presents the results of the experiments conducted by the author.

The potato tuber contains approximately 16 per cent of starch and only 0.4 per cent of nitrogen. It is capable of retaining until spring 80 per cent of the moisture contained at the time of harvest. During winter storage respiration is active and water, carbon dioxid, and ammonia are given off. Chloroform vapor arrests the exhalation of carbon dioxid and when the tuber is exposed to it for a prolonged period the vital functions cease and a nitrogenous liquid exudes. When immersed in carbonic acid the tuber is asphyxiated and the solanin occurring principally in the cells, which have changed to a green color under action of light, is obtained. A low temperature decreases the respiration of the tuber and causes an accumulation of reducing sugar in its tissues. Freezing and subsequent thawing give rise to an exudation of an acid liquid containing solanin. In the tissues of the tuber ammoniacal salts are found, and the author demonstrated that nitric acid disappears when a solution of the salts is introduced into the parenchyma. The organic nitrogen of the potato exists partially in the form of a compound insoluble in water, and the other part, which is soluble, consists principally of albumin, coagulable at 70° C. After the albumin has been separated by this process the solanin is found in the remaining liquid.

In the spring the potato produces sprouts spontaneously, but water must reach its exterior to induce root growth at the base of these sprouts. The author observed that during germination large starch grains of the tuber are in process of breaking up and that small starch grains, presumably derived from the larger ones, are present in the sprouts. Green sprouts growing in water containing starch used this substance for food. The roots of sprouts took up ammonia, nitrates, and humic acid, causing an increase in the nitrogen content of the plant. All parts of the plant underground were found to contain nitrates.

Sprouts separated from the tuber were successfully grown in nutrient solutions and in rich soil kept moist with solutions containing plant food. The percentage of organic nitrogen in the dry matter of the young plants doubled in several weeks. The roots living in solutions took up nitric nitrogen until its supply was exhausted and then utilized the nitrogen present in ammoniacal form. The sprouts separated from the tuber and placed in rich soil accumulated large quantities of organic nitrogen and contained, after 5 months of growth, 460 times the quantity contained at planting time. The author calls attention to the fact that a crop of 40,000 kg. of potatoes per hectare, grown by A. Girard, took from the soil only 120 kg. of nitrogen, but concludes that the quantity contained in the stems, leaves, and roots of the plants must have been considerably larger.

Potash and phosphoric acid in the leaf ash of potato varieties rich in starch, J. SEISSL and E. GROSS (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 6, pp. 862–875*).—The results of fertilizer experiments made in this connection showed that potash on the soils under test increased the yield of tubers and their starch content. The use of phosphoric acid alone affected the quantity and quality of the crop unfavorably. When the 2 elements were applied together, the detrimental effects of the phosphoric acid were decreased but not eliminated. The use of potash and phosphoric acid, alone or in combination, always increased the quantity of leaves and stems. Where phosphoric acid was applied, the foliage was of an abnormal color.

Ash determinations indicate that the content of potash and phosphoric acid was greater in the ash of leaves of varieties rich in starch than of varieties poor in that substance. This relation existed during the entire vegetative period and was not influenced by the application of fertilizers. The use of phosphoric acid as a fertilizer in most cases increased the content of this element in the ash of the leaves, while the application of potash had the opposite effect with reference to itself.

Variety tests with potatoes, E. S. BROWN (*Amer. Gard., 24 (1903), No. 424, pp. 86, 87*).—A number of early and late varieties, some of which are new, were tested and the results are here reported, together with a brief description of the different varieties under experiment.

The pollination and fecundation of rye, K. ULRICH (*Inaug. Diss., Univ. Jena, 1902, pp. 63*).—The author reviews the studies of this subject by different investigators and reports the results of his own observations. He concludes that the rye blossom is self-sterile, although he found that self-pollination in a head or several heads of the same plant may cause a normal production of grains. In general, self-fertility is very rare and varies with the variety. Within the variety individual variations occur, so that completely sterile, as well as strongly self-fertile plants, are produced. The results, on the whole, indicate that every variety of rye must depend upon cross fertilization for a normal fecundation and grain production.

Saltbushes, J. J. THORNBER (*Arizona Sta. Rpt. 1902, pp. 262, 263*).—A brief note on the work with saltbushes by the station.

Sugar beets, R. H. FORBES and W. W. SKINNER (*Arizona Sta. Rpt. 1902, pp. 267, 268*).—The results of analyses of Kleinwanzlebener sugar beets, grown in Salt River Valley in 1902, are given in a table. The average results of 18 samples show a sugar content in the beets of 15.7 per cent, with a purity of 81.7 The average yield per acre was 19.5 tons.

The sugar beet from an agricultural and industrial standpoint, L. GESCHWIND and E. SELLIER (*La betterave agricole et industrielle. Paris: Gauthier-Villars, 1902, pp. 668, figs. 129*).—Historical notes on the culture of sugar beets and the manufacture of beet sugar are given, and the production of sugar-beet seed and the general culture of the crop are discussed. The subject is further considered from a botanical and chemical standpoint, and remedies and preventive measures against insect enemies and plant diseases are suggested. The relation of sugar-beet culture to the sugar industry is considered at some length.

Fertilizer experiments with sugar beets, D. N. PRYANISHNIKOV (*Khozyaēne, 1902, No. 13–14; rev. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *3* (*1902*), *No. 3, pp. 376–378*).—The results of fertilizer experiments with sugar beets in different localities were presented at the third congress of experiment station workers, which convened on the estate of P. I. Kharitonenko and was attended by 61 persons. The reports from the different regions showed that superphosphate has a very beneficial effect on the quantity and quality of the crop, and that this effect is increased when nitrate of soda is used in conjunction with the superphosphate. Although containing twice as much phosphoric acid, bone meal was inferior to superphosphate. The same was observed with Thomas slag.—P. FIREMAN.

Variation in the sugar content of swedes under different conditions of growth, S. H. COLLINS (*Jour. Soc. Chem. Ind., 21* (*1902*), *No. 24, pp. 1513–1516, figs. 3*).—The methods of analysis are described and the results are presented in tables. Storing increased the sugar content from 6.30 to 6.94 per cent, or nearly one-tenth. This is ascribed to the loss of water by evaporation and the conversion of other constituents into sugar. The effect of the season is shown by a comparison of the average sugar content of the varieties grown, which was 6.26 per cent in 1900 and only 4.05 per cent in 1901. The richest varieties were Stirling Castle, X L All, Fell Bronze Top, and Arctic. It is concluded that under any reasonable conditions the effect of different manures on the sugar content is very small. The weight of sugar produced per acre was not always proportional to the weight of total crop.

Wheat culture and its profits in Central and Southwestern Russia, A. BORCHARDT (*Der Weizenbau im südwestlichen und zentralen Russland und seine Rentabilität. Berlin: Deut. Landw. Gesell., 1902, pp. 34*).—This is a report on the culture of wheat in central and southwestern Russia including a consideration of the economic conditions under which the industry exists.

Assimilation of plant food in wheat and rye, H. JUHLIN-DANNFELT (*K. Landt. Akad. Handl. Tidskr., 41* (*1902*), *No. 2, pp. 134–136*).—Experiments with wheat and rye were conducted at Ultuna Agricultural College by A. Ulander at the suggestion of the author. The conclusions drawn from the results with reference to the fertilizer requirements of the wheat plant at different stages of growth are at variance with those of Liebscher on this subject. In these experiments it was found that wheat which had formed hardly 2 per cent of the dry matter of the mature plant in the fall had, at this time, taken up only from 2.8 to 3.3 per cent of the nitrogen and potash and 7.3 per cent of the phosphoric acid given in the fertilizer application. From the beginning of June an energetic assimilation of the plant-food elements took place, the quantities of the different elements taken up being about equal. After blossoming, when the leaves begin to wither, assimilation decreases, and this is especially noticeable in the quantities of potash and lime used by the plant at this stage. Wheat requires abundant soil fertility for the production of large crops, but a good strong soil gives better results than the use of a heavy application of easily soluble fertilizers. Rye differs from wheat in that it takes up a comparatively large proportion of the necessary plant food in the fall. It is, therefore, more benefited by heavy applications of fertilizers than wheat and also because it is generally grown on poorer soils.—F. W. WOLL.

Production of economic plants in the Desert of Sahara, E. DÜRKOP (*Inaug. Diss., Univ. Jena, 1902, pp. 57*).—This dissertation contains a general description of the Desert of Sahara, together with more detailed discussions of the regions producing rubber, dates, senna, fibers, and colocynths.

Statistics of field corps (*Twelfth Census United States, Census Rpts., vol. 6* (*Agriculture, pt. 2*), *pp. 7–275, 401–594*).—General statistical and historical summaries concerning the culture of the different crops are given with tables presenting the figures for the different States in detail. The following table is a summary of this information:

Acreage, quantity, and value of farm crops in the United States in 1899.

Crops.	Acres.	Quantity.				Value.
		Bushels.	Tons.	Bales.	Pounds.	
Corn	94,913,673	2,666,324,370				$828,192,388
Wheat	52,588,574	658,534,252				369,945,320
Oats	29,539,698	943,389,375				217,098,584
Barley	4,470,196	119,634,877				41,631,762
Rye	2,054,292	25,568,625				12,290,540
Buckwheat	807,060	11,233,515				5,747,853
Broom corn	178,584				90,947,370	3,588,414
Rice	342,214				250,280,227	6,329,562
Kafir corn	266,513	5,169,113				1,367,040
Flaxseed	2,110,517	19,979,492				19,624,901
Clover seed		1,349,209				5,359,578
Grass seed		3,515,869				2,868,839
Hay and forage	61,691,069		84,010,915			484,254,703
Cotton seed			4,566,100			46,950,575
Cotton	24,275,101			9,534,707		323,758,171
Tobacco	1,101,460				868,112,865	56,987,902
Hemp	16,042				11,750,630	546,338
Hops	55,613				49,209,704	4,081,929
Peanuts	516,654	11,964,109				7,270,515
Peppermint	8,591				187,427	143,618
Dry beans	453,841	5,064,490				7,633,636
Castor beans	25,738	143,388				134,084
Dry peas	968,370	9,440,210				7,908,966
Sugar cane	386,986		4,202,202			
Sorghum cane	293,152		291,703			815,019
Sugar beets	110,170		793,353			3,323,240

HORTICULTURE.

Problems in orchard pollination, G. O. GREENE (*Industrialist, 29* (*1902*), *No. 11, pp. 163–178, figs. 5*).—The causes of failure of apple blossoms to set fruit are discussed by the author under the following heads: The trees or the blossoms may be injured by drought; they may lack nourishment or receive an excess of certain kinds of nourishment; the fruit buds may be injured from winter freezes or late spring frosts; and, finally, blossoms may fail to set fruit from improper pollination. The last factor was made the subject of special investigation during the season of 1902. Pollination experiments were made in the orchard of the Kansas Agricultural College with a large number of varieties of apples, beginning in most instances practically as soon as the pistillate parent was about three-fourths in bloom. The attempt was also made to use pollen from the staminate parent when the tree was in about the same condition. The results secured show considerable variation in the potency of the pollen of different varieties, both on their own pistils and on the pistils of other varieties. The proportion of fruit set to the number of flowers pollinated with pollen from the variety named was found with a few varieties to be as follows: Ben Davis, 25 per cent; Huntsman, 37½ per cent; Cooper Early, 37½ per cent; Grimes Golden, 29 per cent; Jonathan, 52½ per cent; Smokehouse, ½ per cent; Missouri Pippin, 33⅓ per cent; Winesap, 30 per cent; Wine, 29 per cent. This list indicates Jonathan, Huntsman, and Cooper Early as valuable pollenizers for orchards. The data for Ben Davis, as well as for the other varieties, were obtained from 2 or more trees. One hundred blossoms of Ben Davis were covered and thus allowed to fertilize themselves. Out of this number 26 set fruit. This result is stated to differ from that of Waugh, who found Ben Davis self-sterile. The author states that the self-pollinated Ben Davis fruits were not so large nor so vigorous as those from cross fertilization. The experiments also showed that there was a greater tendency with the self-pollinated apples to fall from the tree before attaining the size of a hazel nut than with the cross-pollinated fruit. The potency of Jonathan, Cooper Early, and Huntsman was strongly brought out when these varieties were used to cross pollinate Grimes Golden, Arkansas Black, and Mammoth Black Twig. These latter varieties failed to set a single fruit outside the bags used to cover the cross-pollinated blossoms.

The variety Jonathan, while standing at the head as a pollenizer of other varieties, was not as potent on its own pistils as Cooper Early. The variety Kinnaird was found especially potent on its own pistils. Thirty-five blossoms of this variety were covered with paper sacks before they opened and produced 35 well-formed fruits. These were but little smaller than the remainder of the fruits on the tree, which was loaded. The Kinnaird is a late-blooming variety and it is hoped that it may have considerable value as a pollenizer for Ralls and other late-blooming varieties.

Attention is called to the fact that varieties listed as shy bearers are those in which the selective power of the pistils is developed to the injury of the fruitfulness of the variety. Thus Jonathan, which is capable of fertilizing nearly every variety in the orchard, responds to but few varieties of pollen itself. Ben Davis, on the other hand, while of little value as a fertilizer for other varieties, responds to almost any variety of pollen.

In studying the agents of pollination, honeybees were found most useful. The bees work for the most part on the side of the tree away from the wind. With an east wind, 20 bees were counted on the west side of a Huntsman tree in full bloom and but 8 on the east side. With a south wind blowing at the rate of 7 or 8 miles per hour, 16 bees were found on the north side and 5 on the south side. Similar figures were obtained at other times with the Kinnaird variety. The bees worked in full sunshine in one case and in shade in another. So far as observed, the bees in every case chose the side of the tree most protected from the wind. Bees were noticed to visit the same flower 5 or 6 times within the course of 25 or 30 minutes. While the honeybee was found the greatest agent in pollination, enough other bees were present to insure a crop of fruit when the weather was favorable.

The extent to which the wind acts as an agent in distributing pollen was determined by exposing prepared microscopic slides at different distances from the tree and at different heights from the ground. The slides were exposed for varying periods of time and afterwards carefully examined to see how many pollen grains had been caught. The results obtained indicate that the wind does aid in pollination though not to any great extent in the case of apples. Sometimes slides at considerable distances would be found to have caught more pollen grains than those nearer the tree. This was thought to be due to the fact that the pollen grains of the apple hold together to a certain extent and the farther they are blown from the tree the more likely they are to become separated by the wind.

A table is given showing the results of pollination obtained with a large number of varieties.

The need of a more systematic and natural classification of varieties than is offered by Thomas, Downing, or Warder is pointed out. The author found in studying the forms of blooms and the size and shape of the organs of the flowers that each variety possesses definite characteristics that might be used to distinguish it from other varieties. Modification of the pistil to insure pollination or prevent self-fertilization is a frequent characteristic. Thus the pistils of Grimes Golden were found to recurve outward to such an extent in some cases as to make self-pollination absolutely impossible. Ben Davis has a very straight, upright pistil, and Smokehouse a very large, knobbed pistil. "These modifications of pistils, the habits of the anthers in dehiscing, the shape, size, and color of the flower, the fruits and the definite characters of the lately introduced Russian varieties all offer a basis of scientific classification of the apple."

Self-sterility of orchard fruits, EWERT (*Proskauer Obstbau-Ztg.*, *7* (*1902*), *No. 11, pp. 161–166*).—The author's experiments showed that the apple Golden Pearmain is practically self-sterile, only one well-formed apple being obtained out of 48 pollinations made using pollen from the same tree. Ten good fruits were obtained from 27 pollinations when pollen from trees of other varieties were used. Notwithstanding these results, the author found that long lines of Golden Pearmain trees along highways from 300 to 350 meters from any other apple trees regularly produced good crops. His advice is that under German conditions, where villages are close together and many kinds of fruits are grown, mixing varieties in plantings is not necessary.

The sweating of apples, R. OTTO (*Proskauer Obstbau-Ztg.*, *7* (*1902*), *No. 10, pp. 156–159*).—The chemical changes that occur in apples during the sweating period were investigated by the author. In the first instance the apples were placed in a heap under a glass bell jar and examined from time to time thereafter. Under these conditions the sweating of the apples caused a loss in the water content and a corresponding increase in the dry matter. With somewhat immature apples the starch content decreased 4 per cent within 10 days and after 23 days had entirely disappeared. The sugar content increased, at the same time, from 9.98 to 11.51 per cent at the end of 23 days. With another lot of apples, somewhat riper, the starch content decreased 3.81 per cent after 17 days, while the sugar content rose from 10.10 to 11.53 per cent in the same time. With still riper fruit the starch content decreased 1.6 per cent in 14 days, while the total sugar content increased during the same period from 12.86 to 13.26 per cent. The acid content of the apples in all cases during the sweating period decreased from 10.26 per cent, in the first case mentioned above, to 8.27 per cent after 23 days, from 9.41 to 8.17 per cent after 17 days in the second case, and from 8.5 to 8.4 per cent in the third case after 14 days. The extract content also increased during the sweating period in all of the above cases.

In another experiment, where the apples were allowed to sweat in piles out of doors, as is usual in cider making, practically the same results were obtained. The results taken as a whole are therefore believed to show that the sweating of apples is advantageous in the manufacture of cider, since by this process the extract and sugar content of the apples can be increased within a comparatively short time. It is especially desirable with apples not yet fully ripe, since these contain comparatively large amounts of starch, which needs to be converted into sugar for the manufacture of good cider. The apples must not be allowed to lie too long, however, after the starch has become converted into sugar. Fruit under a bell jar in the experiment mentioned above increased in sugar content from 9.98 to 11.51 per cent within 23 days; but after 49 days it had again decreased to 10.4 per cent.

Cold storage of fruit (*Canad. Hort., 25* (*1902*), *No. 10, pp. 404, 405*).—The results secured in the cold storage of fruit by Professors Hutt and Reynolds of the Ontario Agricultural College are reported as follows:

"Apples and pears keep best when wrapped singly in paper and packed in a shallow box not larger than a bushel. They ship best when, in addition, they are packed in layers and excelsior between. Apples keep better at a temperature of 31° than at a higher temperature. . . . Cold storage can not make bad fruit good; neither can it keep bad fruit from becoming worse. Only good specimens will keep for any length of time in cold storage and pay for the storage.

"For long storage it pays to select the best fruit and to pack it in the best manner known. The extra labor and the cost of material are more than repaid in the greater quantity and better quality of fruit left at the end of the storage period. With apples and pears at least, and, it seems likely, for most kinds of fruit, the fruit should be picked and stored in advance of dead ripeness. The maturing process goes on more slowly in cold storage than on the tree or bush."

Perfect specimens of medium sized apples and pears have been found to keep longer than the largest sizes picked at the same time. It is advised, therefore, that with pears and peaches the largest specimens be picked first and the smaller ones left to mature later.

"Fruit on being removed from cold storage should be allowed to warm gradually, and moisture should not be allowed to deposit upon it. But if the wetting can not be prevented, then the fruit should be spread out and dried as quickly as possible. With all kinds of fruit there is a time limit beyond which it is unprofitable to hold the fruit in cold storage or anywhere else. That limit, for sound fruit, is dead ripeness. Duchess pears can be kept profitably until late in December; Fameuse, or Snow, apples, until March or April. The time limit has to be determined for each kind of fruit."

The relation of color to the killing of peach buds by cold, J. C. Whitten (*Inaug. Diss., Univ. Halle, 1902, pp. 35, pl. 1*).—The author has investigated the winter temperature and the difference in the rate of transpiration of green and purple fruit buds and branches, and presents some data showing the value of whitewashing fruit trees to retard the swelling of the fruit buds and to maintain a more uniform tree temperature during the winter resting period. Part of the data relating to whitewashing peach trees in Missouri and the temperature of tree twigs have been previously noted (E. S. R., 9, p. 835; 12, p. 643).

The author found that when the sun shone clearly in the morning whitewashed twigs did not warm up so rapidly as the surrounding air and only gradually reached that condition after noon. In sunshine, green and purple colored twigs reached a higher temperature than the surrounding air. When the sun was very bright the purple twigs were sometimes as much as 2° warmer than the green twigs. In one experiment on a sunshiny day in February the temperature in a purple colored twig was 10° C. When a black cloth was placed between the sun and the twig the temperature fell within 5 minutes to $5\frac{3}{4}$° C. and rose again to 10° within 3 minutes after the cloth was removed. When twigs were blackened they absorbed slightly more heat than purple-colored twigs.

In order to determine the relative rate of transpiration of green and purple colored twigs, an equal weight of twigs of both colors was gathered and placed in a dry atmosphere in the laboratory in clear sunlight for 4 hours. At the end of that period the twigs were again weighed, when it was found that the purple-colored twigs had transpired fully twice as much water as the green-colored twigs. The experiment was repeated with large branches with practically the same results.

These experiments indicate that purple twigs on trees not only absorb more heat in sunshine, but also transpire a greater amount of water than green twigs and of course more than whitewashed twigs. Relative to the application of whitewash, the author states that it should be put on before the swelling of the buds begins. In Missouri peach buds one season began swelling in January. Toward the latter part of the resting period the buds start into growth much easier than earlier in the winter. The trees should be thoroughly whitewashed with 2 or more applications. The whitewash sticks better if made with 5 per cent skim milk.

The date-palm orchard, R. H. FORBES (*Arizona Sta. Rpt. 1902, pp. 240–246*).—The date-palm orchard now at the station comprises 556 trees, made up of 81 different varieties obtained from the Sahara, Egypt, Arabia, and Beluchistan. In addition there are 64 local 5-year-old seedlings. There are 327 suckers on the young trees, but it is thought that these can not be advantageously removed for 2 or 3 years. During the year 16 trees of the Rhars and 1 of the Deglet Noor varieties blossomed and produced a small crop of fruit. The date-palm scale has been brought under control by the use of hydrocyanic-acid gas fumigations.

Dates, A. J. MCCLATCHIE (*Arizona Sta. Rpt. 1902, p. 252*).—Tests of date seed planted during the year indicate that these should be placed in the ground before the warm weather of spring, preferably some time between October and February. Late planted seed do not make as vigorous growth as seed planted earlier in the season. It has been found desirable in transplanting to keep a ball of earth around the roots and cut the leaves back to within a few inches of the ground.

Variety test of strawberries, O. M. TAYLOR (*New York State Sta. Bul. 218, pp. 179–202, pl. 1*).—Data are given showing the date of coming into bloom, date of first and last pickings, and total yield for 20-ft. rows of 56 varieties of strawberries. Most of the sorts grown were of quite recent introduction. Brief descriptions are given of all the varieties tested. A series of early spring frosts considerably reduced the yields of a number of varieties. The best yielding varieties were Crescent, Riehl No. 29, Monitor, Manokin, Beder Wood, Howard No. 2, and Riehl No. 26, ranking in the order named. Of these varieties, Riehl No. 29 produced too many light-colored and small berries to be highly recommended. The fruits of both Manokin and Howard No. 2 were too soft and of rather poor quality. Among the newer varieties thought worthy of trial are Bennett, Henry, Joe, Kansas, Monitor, Prof. Fisher, Riehl No. 26, Riehl No. 31, and Rough Rider. The largest early yields were given by Beder Wood and Crescent. Johnson Late was the latest variety to ripen, but lacks color and firmness. Prof. Fisher makes but few runners, and should therefore be planted closer than other varieties. Henry and Sample should be sprayed, since they are especially subject to leaf blight.

Strawberries in 1902, F. H. HALL and O. M. TAYLOR (*New York State Sta. Bul. 218, popular ed., pp. 4, fig. 1*).—A popular summary of the above bulletin.

Strawberries, A. J. MCCLATCHIE (*Arizona Sta. Rpt. 1902, pp. 253, 254*).—The varieties Excelsior and Texas, both early varieties, have proved very satisfactory at the station, enduring the summer heat as well as any varieties ever tried there. It has been found that plants grown along shallow, open furrows do better than those grown on the sides of endless ditches. "Mulching with fine straw early in June has proved of value in enabling plants to endure the heat and drought of summer, especially during the first season after setting. Plants kept clean, and thus left exposed to the rays of the sun, make better growth than those where weeds are left to grow for shade."

New methods of grafting and budding vines, E. H. TWIGHT (*California Sta. Bul. 146, pp. 13, figs. 10*).—Details are given for making the green cleft graft, Horwath graft, Salgues graft, Besson graft, Clarac graft, Massabie graft, and Vouzou graft. The author states that in vineyard work the Salgues graft is coming to be quite generally used. It is simple, forms a perfect union, and is of great value in reestablishing vineyards on resistant stock. This graft consists essentially of fixing on a green shoot of the year an elliptic scion or shield carrying a bud at its center. In order that it be successfully used, it is necessary that the stock should be in full sap. In the Horwath graft the scion bud is inserted in the place of an eye of the stock. The Besson graft, which is a form of inlaying, has not been a success at the station when tried on green shoots. With ripe canes the results have been very satisfactory. The Vouzou graft is a Salgues graft made with an old scion bud. From 75 to 85 per cent of the grafts of this sort made at the station have commonly taken, and in one instance the success of 95 per cent was reported. "It is a simple graft and gives a perfect union. In case of failure, it is easy to repeat it the same season." The following directions are given for the selection of shoots bearing buds for scions:

"We should always choose branches growing from eyes which would have normally remained dormant till the following season, in preference to branches growing from buds bursting out normally. Shoots of medium or rather small diameter are to be preferred. These shoots will furnish the scion buds which are to be grafted on the old wood. The diameter of the shoot from which the scion bud is cut must always be a little smaller than the diameter of those upon which it is to be grafted. The best shoot is that developed in the shade; branches exposed to direct sunlight must always be rejected; the shoot should be light green in color, but not yellow. The petioles of the leaves of the shoot should be of a whitish-green color, even a little pinkish, slightly transparent at the point of junction with the limb. Shoots bearing leaves with deep green or reddish petioles should be rejected. The eyes of the extremity and base of the shoots, together with those placed at the base of the leaves having a very slender or very long petiole, should not be used."

In the preparation of scion buds, scions with half sapwood are considered far superior to scions with sapwood. In the station experiments the largest amount of budded wood was obtained when the shoots of the mother stocks were tied up in a V shape as soon as hard enough. The axillary buds and tendrils are removed at the time, and this operation is repeated 3 times during the season.

A study of grape pollen and what the results indicate, N. O. Booth (*Amer. Gard., 23 (1902), Nos. 414, pp. 767, 768; 415, pp. 784, 785*).—Experiments were made during the summer of 1902 to determine, if possible, why certain varieties of grapes were self-sterile. The degree of self-fertility of 169 varieties of grapes has been previously noted (E. S. R., 11, p. 248). The work of the season has centered around two phases of the problem: (1) Whether the pollen on the self-sterile varieties might not be so scanty as to make self-fertilization impossible; and (2) whether lack of viability in the pollen itself might not be the cause of impotency on its own pistil as well as on all other varieties. As to the amount of pollen present, the investigations of the season showed that "there were greater variations on different clusters of the same vine than normally appeared on different vines of different varieties." The first and last clusters to bloom on the vine are usually not so well supplied with pollen as those blooming at the height of the season. In some cases the amount of pollen found was apparently insufficient to make pollination at all certain, but generally with most of the self-sterile sorts pollen was plentiful and apparently sufficient for pollinating purposes.

The viability of the pollen was studied by germinating the pollen grains in dilute sugar solutions. The percentage of sugar used varied in the different solutions from 1 to 20. The smallest percentage was found too weak in some instances, and most of the germination tests were made in 20 per cent solutions. With the self-fertile varieties germinations of the pollen varying from 4 to 95 per cent were obtained in these solutions, while with the self-sterile sorts the pollen did not germinate at all or made only a feeble growth, varying from 1 to 5 per cent. Besides these differences in germinating power of the pollen from self-sterile and self-fertile varieties, there was a difference in the behavior of the pollen which seemed to be quite constant. "The self-fertile grains seem to be surrounded by a mucilaginous substance which makes them stick to one another more or less, so that the pollen, whether it lies dry on the slide or is placed in liquid media, arranges itself in a succession of clumps. This mucilaginous substance does not appear to be soluble in water, as the pollen grains retain their position even after several days in the solutions. The self-sterile pollen, on the other hand, shows no such arrangement, but the grains distribute themselves either on the slide or in the liquid like so much dry powder, quite by chance."

Microscopical examination of the pollen showed that with self-fertile varieties the dry pollen grains were oblong, blunt at the ends, and quite symmetrical. The pollen of the self-sterile sorts was more irregular, showing little of the symmetry of the other class. Varieties that were partly self-fertile had pollen grains of the two classes and intermediate forms. With these sorts the growths of pollen obtained in dilute sugar solutions were weak and had an unhealthy appearance. Experiments with large numbers of these varieties indicated that the "percentage of pollen which germinated did not vary widely from the percentage of self-fertile forms which the microscope showed that particular variety to contain." Pollen of the different varieties examined varied considerably in size, but there was no apparent connection found between the size of the pollen grains and their germinating power.

This lack of viability or potency of the pollen grains of self-sterile varieties is believed to be the main cause of self-sterility of grapes and sufficient in itself to account for this class of phenomena. The results obtained have an important economic value in choosing pollenizers for self-sterile grapes, since they give a method of selecting the best varieties for this purpose without waiting to make vineyard trials by sacking, etc., heretofore necessary. The sexual status of varieties can also be determined by this means within a single blossoming season.

The management of greenhouses, E. LONSDALE (*Pennsylvania Dept. Agr. Bul. 97, pp. 41*).—Practical advice is given regarding such matters as ventilation, watering, drainage, heating greenhouses, preparation of soil, control of insect pests and fungus diseases, propagation of plants, and annuals for winter blooming. In the introduction to the bulletin a rather extended account is given of the culture of American Beauty and some other roses.

Mature *v.* immature lily bulbs, A. F. WOODS (*Florists' Exchange, 14 (1902), No. 16, p. 462, fig. 1*).—Fifty healthy plants of *Lilium harrisii*, growing in one of the best bulb fields of Bermuda, were selected to test the relative value of mature and immature bulbs. Twenty-five of these plants were dug about the middle of May and the bulbs shipped to the United States where they were stored in a cool place. The remaining 25 plants were dug and shipped the latter part of July. At this time the tops of the plants were dead. Both lots of bulbs were planted in pots in August in the usual manner. The following winter the immature bulbs produced 64 per cent of badly diseased and worthless plants and 36 per cent of poor plants, averaging but 4⅓ flowers each. The mature bulbs produced 68 per cent of good strong plants, averaging 7 flowers each, and 32 per cent showing some disease of the leaves, but even with these most of the flowers were all right. The plants were ⅓ taller than those from immature bulbs. These results are believed to show clearly the great desirability of mature bulbs.

Statistics of horticultural products (*Twelfth Census United States, Census Rpts., vol. 6 (Agriculture, pt. 2), pp. 277–399, 595–795*).—Some of the general results secured in the U. S. Census of 1899–1900 on the production of certain vegetables, fruits, flowers, etc., are briefly noted below.

Vegetable culture.—In 1899, 5,753,191 acres or 2 per cent of the total area of the country devoted to crops was planted in vegetables. The vegetables grown had a total value of $238,846,908, which is about 8.3 per cent of the total value of all farm crops. The average value of all farm products per acre was $10.04, while for all vegetables it was $42.09. The potato was the most important vegetable grown. It occupied 51.1 per cent of the total acreage devoted to vegetables and was valued at $98,387,614 or $33.48 per acre. The production was 273,328,207 bu., an increase of about 25 per cent over the preceding decade. Sweet potatoes ranked second in value of the vegetables grown in the United States, the yield from the 537,447 acres grown being 42,526,696 bu. and the value per acre $36.98. Next in acreage stood watermelons, sweet corn, and tomatoes, more than 197,000 acres being devoted to each crop.

Commercial gardening, that is, truck and market gardening, appears to have increased about 100 per cent at the North and fully 200 per cent at the South during the decade.

Canning industry.—The canning industry has grown rapidly and the annual output is now about double that of a decade ago. The pickles, preserves, and sauces put up in 1900 were valued at $21,507,046, and the canned fruits and vegetables at $56,668,313, of which the vegetables approximated but did not exceed one-half the total value. About two-thirds of the vegetables canned consist of corn and tomatoes. Peas stand next in importance. The number of cases of vegetables holding 24 cans each packed in 1899 was as follows: Tomatoes, 8,905,833; corn, 6,365,967; and peas, 2,738,251. Standard tomato cans hold 3 lbs. each and corn and pea cans 2 lbs. each. Maryland and New Jersey were the heaviest packers of tomatoes, New York and Illinois of corn, and Maryland and New York of peas. Considerable quantities of such other vegetables as asparagus, Lima beans, string beans, okra, pumpkin, squash, succotash, sweet potatoes, etc., are yearly put up in cans. The prices of canned goods have decreased about 25 per cent during the last decade.

Fruit culture.—The total value of all fruits produced in the United States in 1899 was $131,423,517. Orchard fruits alone were valued at $83,751,840; grapes, $14,090,937; small fruits, $25,030,877, and subtropical fruits, $8,549,863. During the last decade orchard fruit production as a whole increased 15.4 per cent. Apples alone constituted 55 per cent of all orchard trees, peaches and nectarines 27.2 per cent, and plums and prunes 8.4 per cent. The total acreage of small fruits was 304,029, and the value of the product per acre $82.33. Strawberries constituted about 50 per cent of the total acreage of small fruits. Raspberries stood next in importance.

The total value of all cultivated nuts was $1,950,161. California alone reported 73.9 of this total. That State leads in the production of almonds and English walnuts. Texas leads in the production of pecans.

Floriculture.—In 1899 there were 30,417 farms reporting land under glass, representing a total of 96,230,420 sq. ft., or over 2,200 acres. Of this number 6,159 were commercial florists' establishments, having about 51,023,000 sq. ft. of land under glass. The total wholesale value of floricultural products was $18,759,464, of which $17,377,860 was for florists' products. The retail value, it is thought, could not have been less than $30,000,000. The annual income from cut flowers alone is estimated at $12,000,000 to $14,000,000. The sale of cut roses is estimated at $6,000,000, carnations $4,000,000, violets—which stood third in importance—$750,000, and chrysanthemums $500,000. The annual production of roses and carnations is 100,000,000 each, violets 75,000,000. The average prices for roses and carnations is 20 to 25 per cent higher than 10 years previous, while violets, lilies of the valley, and tulips have considerably decreased in price.

Nursery industry.—Relative to the nursery business the twelfth census showed a total of 2,029 establishments, with 137,459 acres devoted to the growing of young trees. The value of the products from this area was $9,231,503. New York leads in the production of nursery stock with a total of 237 establishments, yielding products valued at $1,703,354. Other leading States in value of product are Iowa, $636,543; Illinois, $610,971; California, $533,038; Ohio, $538,534, and Pennsylvania, $515,010.

FORESTRY.

Eucalypts, A. J. McCLATCHIE (*Arizona Sta. Rpt. 1902, pp. 252, 253*).—A brief account is given of experiments which have been conducted in the propagation and culture of various species of Eucalyptus. A heavy frost in December, following an unusually warm autumn, destroyed a number of species which had withstood previous low temperature. *Eucalyptus rostrata* was killed to the ground, but sent up sprouts the following spring. *E. salubris* and *E. corynocalyx* were killed entirely. *E. rudis*, *E. polyanthema*, and *E. leucoxylon* were slightly, if at all, injured by the frost and also endured well the heat of Arizona summers. These 3 species have all proved adapted to the region, the first being the most desirable for general planting. The results of several years' experiments and observations upon Eucalyptus have been previously reported (E. S. R., 14, p. 575).

Spontaneous groups of seedlings, A. C. FORBES (*Gard. Chron., 3. ser., 32 (1902), No. 829, pp. 351, 352*).—The writer comments upon the tendency of different species of forest trees to reproduce themselves by natural seeding. With regard to conifers the only species that can be said to regenerate itself freely in England is the Scotch fir and then only after a clear cutting and under conditions which remove the seedlings from the shade and raw humus about the parent trees. In large pure forests the white pine and silver fir reproduce themselves to some extent, but neither the larch nor spruce show any inclination to spontaneously restock the ground. The author believes that the white pine would freely reproduce itself under shade, and prove to be one of the most valuable of introduced species, except for the inability of coniferous seedlings to push their way through a thick growth in these places where they are most likely to germinate. The most success in natural regeneration is to be expected with hardwoods, particularly the ash, beech, birch, oak, chestnut, etc. Of the heavier seeds, such as the beech, oak, and chestnut, it is necessary that they should get into the soil, and the simplest and one of the most effective methods of securing this is that of cutting a portion of the parent trees as soon after the fall of the seed as possible. The treading of the woodmen, removal of timber and brush, etc., force the seeds to enter the ground where they readily germinate. On heavy ground with little or no surface vegetation or humus this condition is almost indispensable. It is stated that young oaks appear in numbers only when coppice has been cut over during or following a year of abundant seed production. In the case of ash, birch, and sycamore the seed are more widely scattered and better adapted to getting worked into the soil before germination.

The future of our public forest lands, F. ROTH (*Forestry and Irrig., 8 (1902), No. 12, pp. 498–500*).—This is a suggestion relating to the future policy regarding the control and management of the public forest lands, in which it is proposed that there be withdrawn from settlement, entry, sale, or other disposition all public lands which are more valuable for forest uses than for other purposes. The timber and other products upon such lands are to be protected and utilized according to economic principles.

Review of the lumber trade and forest interests of the South for 1902, D. W. BAIRD (*Tradesman, 48 (1903), No. 9 (24. annual), pp. 130, 131*).—The year 1902 is said to have been a highly prosperous one for the owners, handlers, and dealers of forest products in the Southern States, both in regard to the hardwoods and the pines. The production capacity in the hardwood sections has increased in the South in about the proportion that the timber supply of the northern section has decreased. Notes are given on the timber supply and the demand for different kinds of hardwoods, some of which are apparently increasing rapidly in favor with consumers. The general conditions of the Southern forest region are reviewed, and it is said that the heavy and constant drain upon the Southern forests has given rise to fears in the minds of many that the period of final exhaustion is not far off. This serves to arouse an active interest in the matter and has caused the Government to take action which it is believed will result in the establishment of a forest reserve on the Appalachian mountain range which would not only preserve the timber but be valuable in other ways.

Forest conditions in southern Arizona, R. S. KELLOGG (*Forestry and Irrig., 8 (1902), No. 12, pp. 501–505, figs. 5*).—In the mountain ranges of southern Arizona there are said to be at least 140,000 acres capable of sustaining coniferous forests. These forests are at elevations of from 9,000 to 10,000 ft., the precipation below 7,000 ft. being insufficient for the growth of valuable species. The principal timber tree occurring in this region is the bull pine (*Pinus ponderosa*). This furnishes nearly all the sawed timber of the region, but associated with it are a number of other species of evergreen trees, it being entirely replaced in some places by the Engelmann spruce (*Picea engelmanni*) and the Alpine fir (*Abies lasiocarpa*). The best development of pine is always found on the northern exposures, and the greatest amount of timber in the Chiricahua Mountains, where an average of 5,000 ft. B. M. to the acre is estimated for at least 50,000 acres. The rate of growth of bull pine in southern Arizona is said to be quite rapid, and figures are given showing the average increment. Two forms of this pine are recognized by the lumbermen, but specifically they are said to be identical. The reproduction of this species is insufficient and unsatisfactory as a general thing, due to a number of factors which are briefly indicated.

The forests of Rhode Island, F. W. CARD (*Rhode Island Sta. Bul. 88, pp. 39, pls. 8, figs. 18*).—A general sketch is given of the subjects of forests and forestry, and a review of the present condition of the forests of Rhode Island. Referring to a statement, made in 1887 in a report of the Division of Forestry of this Department, to the effect that in a strict sense the forests had ceased to exist in Rhode Island, and that practically all the timber reported as cut in the State had been brought from other States, the author shows that in 1900 there were 33 sawmills in the State, which cut 18,265,000 ft. B. M. of white pine, chestnut, oak, ash, birch, maple, black walnut, and hickory lumber. This does not include the fire wood, which is produced in a considerable quantity within the State. The present forested areas are described, their characteristic species being mentioned, and descriptive lists are given of the more important forest trees which either occur or might be planted with a reasonable prospect of success.

Forestry in Germany, J. E. KEHL (*U. S. Consular Rpts., 71 (1903), No. 268, pp. 81, 82*).—A brief account is given of the methods of forest management in Germany, and a statement given as to the area devoted to forestry. According to the imperial statistics for 1900, there were 34,569,926 acres in forest, an increase of 216,178 acres since 1883.

Forestry in Natal, J. S. LISTER (*Agr. Jour. and Min. Rec. [Natal], 5 (1902), No. 19, pp. 603–612*).—As a preliminary to the reorganization of the forestry bureau of Natal, the author has made a survey and report to the authorities on the forests of that region. The extent and value of the forests of Natal and Zululand are indicated and suggestions given for their conservation and systematic exploitation. The author has found a number of exotic species of timber trees which have shown very remarkable growths, and suggests the more extensive planting of some of these.

Tree growing at high elevations in Ceylon (*Agr. Jour. and Min. Rec. [Natal], 5 (1902), No. 19, pp. 629–631*).—A brief account is given of the rate of growth of various species of Eucalyptus, Acacia, bamboos, and ornamental and other trees at considerable elevations in the island of Ceylon.

Blue gums as forest trees, C. H. MCNAUGHTON (*Agr. Jour. Cape Good Hope, 21 (1902), No. 6, pp. 567–588*).—An account is given of various plantations which have been made of the blue gum (*Eucalyptus globulus*) in the Midland Conservancy, Cape

Colony, the report being prefaced with an account of the climate, soils, rainfall, and winds of the region and comparisons drawn from other artificial plantations of this species. The tree readily reproduces itself from seed and is well adapted to coppice as well as standard growth. The blue gum was said to have been introduced in Europe probably as early as 1820 and since that time has been brought under cultivation in a number of localities. Tabular reports are given of the total and mean annual growth of this species in a number of regions, the annual increment varying from 273 to 696 cu. ft. per acre. After the general discussion of the subject an account is given of plantings in South Africa, one of which contains 20 acres and was planted at a cost of $30.75 per acre. This includes the clearing and preparation of the land, together with the care of the trees until they are about 2 years old. The author estimates that plantings conducted at this rate would give a clear profit of about $7 per acre if conducted by the government, or if funds could be borrowed at as low rate as 2½ per cent, which is readily secured by the government. The growth and acre increments are given, together with the data regarding the planting of 12 plantations which ranged from 3 to 12 years old.

Wood and cork, E. D'HUBERT (*Le bois et le liège. Paris: J. B. Baillière & Sons, 1902, pp. 96, figs. 31*).—A description is given of the anatomical, physical, and chemical characteristics of various kinds of timber, descriptions of the timber-producing species, the commercial production, conservation, and utilization of forest products, together with statistics of forest production.

SEEDS—WEEDS.

The influence of heat on the germination of seeds, H. H. DIXON (*Gard. Chron., 3. ser., 32 (1902), No. 821, p. 217*).—A brief account is given of a paper read before the botanical section of the British Association, in which the author's experiments on the resistance of seeds to high temperatures are described. As preliminary to the experiments the seeds were dried either over sulphuric acid or in ovens, the temperature of which was gradually raised to 90° C. After drying they were exposed for an hour or more to a higher temperature and then sown on moist sand. The seeds of the different varieties showed individual differences in their power of resisting high temperatures. A large percentage of oats would germinate after an exposure of from 100 to 105° C., while very few germinated if exposed to temperatures of 118° C. In general the higher the temperature to which the seeds were exposed, the longer would be the period of germination. Long exposure to comparatively low temperatures was found to be more fatal than a short exposure to a much higher one. Those seeds which germinated successfully after 1 hour's exposure at temperatures of 110 to 120° C., would not germinate at all if exposed for 12 days to temperatures of 95 to 97° C.

The germination of seeds after exposure to high temperatures, H. H. DIXON (*Notes Bot. School, Trinity Col., Dublin, 1902, No. 5, pp. 176–186*).—In continuation of experiments previously reported (E. S. R., 13, p. 462), the author has investigated the effect of high temperatures as influencing the germination of seed, and has been able to confirm the results previously obtained. Exposure of seed to high temperatures retards the germination, prolonging the period for a considerable time. In many cases the germination of seed in the experiments was abnormal, the most frequent abnormality being the protrusion of the cotyledons instead of the radicle from the seed. In many instances where the radicle emerged normally it was often abnormal in its subsequent behavior. Although many seeds were found able to withstand high temperatures for a comparatively short period, when subjected to moderately high temperatures for a prolonged time the germination was almost entirely destroyed.

Concerning the germination of leguminous seed and its influence by micro-organisms, L. Hiltner (*Arb. K. Gesundheitsamte, Biol. Abt., 3 (1902), No. 1, pp. 1–102, figs. 4*).—After describing the structure and general characteristics of leguminous seed, some of the injuries to which this kind of seed is subject are discussed and their causes described. The effect of *Ascochyta pisi*, *Cephalothecium roseum*, Penicillium, and various bacteria on the viability of seed are discussed. The occurrence of hard seed in samples of leguminous seed is mentioned and the various methods practiced for securing their germination are described. The relation of soil organisms to leguminous seeds is discussed, and the effect of wounds upon the germination of seed, soaking, scratching seed coats, etc., are given in some detail. The predisposition of leguminous plants to certain root tubercle organisms is stated, and experiments are described in which seed inoculation and soil inoculation were compared. Conclusions are drawn for the information of agriculturists and gardeners.

The action of alcohol on germination of seeds, L. Sukatscheff (*Bot. Centbl., Beihefte, 12 (1902), pp. 137, 138; abs. in Jour. Roy. Micros. Soc.* [*London*], *1902, No. 5, p. 575*).—The author reports that seeds of lupine and pea can remain for a considerable time in alcohol of various strengths without losing their capacity for germination. The wounding of seeds of yellow lupine and peppergrass, or the removal of the testa does not lead to as rapid a loss of germinative capacity as the results of some investigators tend to show.

Resistance of seeds to poisons, H. H. Dixon (*Notes Bot. School, Trinity Col., Dublin, 1902, No. 5, pp. 187, 188*).—In continuation of experiments previously reported (E. S. R., 13, p. 462), a brief account is given of the resistance of seed to the influence of alcohol, corrosive sublimate, etc. The resistance of the seeds to these poisons is attributed to the imperviousness of their seed coats to the fluids in which they were immersed.

California grown sugar-beet seed (*Pacific Rural Press, 65 (1903), No. 4, p. 52*).—A brief account is given of tests of sugar-beet seed grown in California and subjected to the tests required by the German seed test regulations. The large seed, which numbered 41,493 to the kilogram, averaged 185 sprouts to each 100 seed balls. The small seed germinated only an average of 94 as compared with 130 sprouts to the 100 seed balls required by the above-mentioned regulations.

The Canada thistle and dandelion, L. H. Pammel (*Iowa Sta. Bul. 61, pp. 143–148, figs. 5*).—A description is given of the Canada thistle, which is regarded as one of the most noxious weeds of the State, and its distribution so far as represented by herbarium specimens is indicated. Various methods of extermination are described and a report given of attempts to combat this pest by spraying with dilute crude carbolic acid. This did not prove satisfactory, but when the dilute acid was injected about the root stocks they were killed for several inches below the ground. If this method be employed, following it up as the young thistles appear, the pest may be eradicated from lawns or similar regions where the area is not too extensive to permit of this method of treatment. The dandelion is also described as a troublesome weed, particularly in lawns, and the continued mowing of the lawn with occasional pulling up of the plants will after a while eradicate it.

Charlock or yellow weed (*Farmers' Gaz., 61 (1902), No 28, p. 493*).—A brief report is given of experiments conducted on one of the council farms in Lancashire County, in which a crop of clover containing charlock was sprayed with 3 and 4 per cent solutions of copper sulphate, and 12 and 15 per cent iron sulphate at the rate of 50 gal. per acre. Where the 3 per cent sulphate of copper was applied, 2 sprayings being given, less than 1 per cent of the charlock set seed. A single spraying of sulphate of copper gave $9\frac{1}{2}$ per cent and another $24\frac{1}{2}$ per cent of seed-bearing plants. Two sprayings of copper sulphate gave 6 per cent of charlock seed, while 15 per cent spraying of iron sulphate, only 1 application being given, resulted in 47 per cent of charlock seed. The weight of the dried charlock plants was in nearly the same proportion in each case.

Destruction of charlock in grain crops, G. F. STRAWSON (*Farmers' Gaz., 61 (1902), No. 17, p. 309*).—The author made a special effort to inquire into the operations of spraying for the destruction of charlock, and paid particular attention to the age of the plants when sprayed He is convinced that many of the reported failures are due to the late application of the herbicides. If the application was made while the plants were in a rapidly growing, succulent condition, their destruction was effected by the use of a 3 per cent solution of sulphate of copper at the rate of 50 gal. per acre. Not only were the weeds destroyed but the general appearance of the grain crops was improved. The best results followed the use of large power sprayers, and the success of the operation was diminished in proportion to the delay which occurred after the charlock was in the most suitable condition for being destroyed. The suggested use of nitrate of soda in place of copper sulphate has not proved successful on extended trial.

Notes on the destruction of some injurious plants, G. HEUZÉ (*Jour. Agr. Prat., n. ser., 4 (1902), No. 33, pp. 211, 212*).—Notes are given for the destruction of a number of troublesome perennial plants, among them the creeping bent grass, dog-tail grass, wild oats, Tussilago, bindweed, horse-tail rush, horse sorrel, etc. For those species which have perennial root stocks the author recommends fallowing, and early in the spring a thorough and deep harrowing over of the land, after which the root stocks are raked and burned. For the eradication of the Tussilago and the Equisetum, a thorough draining of the soil together with cultivation are suggested. The author recommends the application of fertilizers, particularly of calcareous ones, for combating the horse sorrel. Soils in which this plant grows abundantly are usually characterized by an acid condition which requires the application of lime for its correction.

DISEASES OF PLANTS.

Miscellaneous notes on fungus diseases of plants, L. H. PAMMEL (*Iowa Sta. Bul. 61, pp. 139–142, fig. 1*).—Notes are given on cowpea, clover, and asparagus rusts. The rust of the cowpea was first noticed during the fall of 1901, and numerous specimens were observed whose leaves were covered with brown rusty spots. An examination showed that the cause of the trouble was the fungus *Uromyces appendiculatus*, and so far as the author could ascertain this is the first recorded occurrence on this host. The fungus is rather common upon wild and cultivated beans, usually producing round spots which by confluence become irregular patches upon the leaves. The microscopic characters of the fungus are described and notes given upon its occurrence and distribution upon other host plants.

The clover rust, due to *U. trifolii*, was again noted abundant in 1901. In a previous publication (E. S. R., 3, p. 217) the author called attention to the occurrence of this fungus which was extremely common on second crop clover. It did not increase, and for a number of years was not abundant, but during the fall of 1901 it severely attacked the second crop of clover, causing no little injury to the plants.

Notes are given on the asparagus rust (*Puccinia asparagi*), which first made its appearance in Iowa during the season of 1901. Further information regarding the distribution of this fungus is requested, and the author suggests spraying the plants with a resin Bordeaux mixture, which is commonly recommended for this purpose.

Report of the vegetable pathologist and entomologist, H. TRYON (*Queensland Agr. Jour., 11 (1902), No. 6, pp. 403–408*).—A summary report is given of the insects and fungi observed as injuriously affecting a number of plants during the year. The field work which was carried on by the author is described briefly, particular attention being given to investigations of banana diseases. These troubles seem to be due to a number of causes, among which are mentioned the punctures of minute thysanopterus insects which attack the fruits, a root disease caused by attacks of *Heterodera* *radicicola* and also *Tylenchus* sp., an internal browning and gelatinization of the fruit probably due to the root disease, and a leaf disease which is accompanied by a specific fungus. These diseases will be subjects of further investigation and report. Preliminary investigations have also been begun on diseases of coffee and sugar cane.

The origin and propagation of cereal rusts through the seed, J. Eriksson (*Ann. Sci. Nat. Bot., 8. ser., 15 (1902), pp. 1–160, pls. 5, figs. 10; abs. in Bot. Centbl., 90 (1902), No. 6, pp. 146–150*).—In continuation of his investigations on the cereal rust problem (E. S. R., 11, p. 949), the author gives the results of experimental studies in rust propagation. In the previous paper he advanced the hypothesis of the possibility of infection through the seed, or the mycoplasma theory as it is called, and in the present account examples are given which are held to substantiate that claim. Methods were devised by which cereals were grown to maturity under what appears to have been perfect isolation. In numerous instances the plants were infected with rust even after all precautions had been taken to prevent external infection. In the second part of his paper the methods of propagation of rusts are discussed. It is claimed that cereal rusts can not be propagated either by an intercellular mycelium, as the presence of such a means has not been shown for most species of cereals, or by groups of spores on the surface or in the interior of the grain. It is further claimed that the uredo and teleutospores are not sufficiently abundant to habitually cause infection. Having disposed of these methods of infection the author claims the disease is to a large degree caused by the mycoplasma which exists in a symbiotic stage in the grain. Thus far it has been impossible to demonstrate the presence of this source of infection in its primary state, but it is believed that an intermediate form has been found which connects the invisible plasma and the mycelium of the rust. These are certain minute corpuscular bodies which float about in the protoplasm of the cell and later give rise to mycelium. The varying susceptibility of different varieties is held to be an argument in favor of the author's theory of rust propagation.

The nature of the infection is said to preclude the use of parasitic or fungicidal agencies for the prevention of rust. The treatment recommended is preventive, and the author advises the use of resistant varieties and the abandonment of the cultivation of all varieties which are notably subject to rust. He believes concerted studies should be made in all countries where cereals are injuriously affected by rusts, so that the effect of soils, exposure, fertilizers, etc., on rust may be ascertained, and attempts made to breed more resistant strains and varieties.

The recent literature relating to rusts is reviewed and a bibliography of the subject is appended.

The occurrence and distribution of cereal rusts through the seed, J. Eriksson (*Medd. K. Landtb. Akad. Exptlfält., No. 72, pp. 51, pls. 3, figs. 6*).—This is a discussion of the mycoplasma theory relating to the origin and distribution of cereal rusts. The author recognizes the following species of Puccinia: *P. graminis*, the black rust, the æcidium of which occurs upon the barberry, with 6 specialized forms; *P. phlei-pratensis*, the timothy rust; *P. glumarum*, the yellow rust, with 5 specialized forms; *P. dispersa*, the brown rust of rye, the æcidium of which occurs on certain boraginaceous plants; *P. triticina*, the brown rust of wheat; *P. bromina; P. agropyrina; P. holcina; P. triseti; P. simplex; P. coronifera*, the crown rust, with 6 specialized forms, the æcidium of which occurs on species of Rhamnus; *P. coronata*, with 5 specialized forms; and an unnamed species of which 2 forms are recognized.—F. W. WOLL.

On the specialization of cereal rusts, J. Eriksson (*Medd. K. Landtb. Akad. Exptlfält., No. 73, pp. 25*).—The results of the author's investigations on the specialization of cereal rusts to certain definite hosts are shown. The author considers specialization as an expression of inherent tendencies on the part of the rust toward producing new forms. This tendency is guided by the vegetative and climatic conditions under which the parasite lives. Where a certain host plant is found abundantly and the climatic conditions are favorable to the growth of the fungus the parasite will reach a greater perfection as to its vitality and also a greater degree of systematic stability. On the other hand, if the supply of necessary host plant is limited and the fungus is near the limits of its natural habitat, its development becomes weaker and this weakness is expressed by less sharply defined differences and by a marked reduction in the ability of the fungus to attack new species of host plants.—F. W. WOLL.

The specialization of black rust of cereals in Sweden and other countries, J. ERIKSSON (*Centbl. Bakt. u. Par., 2. Abt., 9* (*1902*), *Nos. 16, pp. 590–607; 17–18, pp. 654–658*).—A review is given of the previous investigations of the author on the specialization of cereal rusts, and the results of inoculation experiments with *Puccinia graminis* from the barberry upon 52 species of grass are described. Upon all of these species of grass the author was successful in securing infections. He is led to conclude that the phenomenon of rust specialization can no longer be attributed to internal, innate tendencies on the part of the rusts to produce new forms, but that it is due to the characteristics of the host plants and the influence of climate, etc., acting upon the parasite.

Cereal rusts, D. MCALPINE (*Jour. Dept. Agr. Victoria, 1* (*1902*), *No. 4, pp. 425–431*).—A general discussion is given of the nature of rusts and the losses due to them; and the results obtained in the experimental plats, in which varying susceptibility of varieties is shown, are given. The most injurious species of rust in Australia is that known as the summer rust (*Puccinia graminis*). Brief notes are also given on the barley and oat rusts (*P. simplex* and *P. graminis*).

Wheat and barley rusts, D. MCALPINE (*Jour. Dept. Agr. Victoria, 1* (*1902*), *No. 5, p. 529, pl. 1*).—Illustrated notes are given of *Puccinia graminis* occurring on barley and wheat, *P. triticina* on wheat, and *P. simplex* on barley.

Culture experiments with rust fungi, H. KLEBAHN (*Ztschr. Pflanzenkrank., 12* (*1902*), *Nos. 1–2, pp. 17–44; 3, pp. 132–151, figs. 5*).—The result of extended culture experiments with a number of rust fungi is reported. Among those studied were species of Melampsora of willows and poplars which have their cæoma stage on Allium, those occurring on willows and Galanthus, on willows and Ribes, and studies of *Melampsora larici daphnoides*, *M. pinitorqua*, *M. larici tremulæ*, *M. rostrupii*, and *M. larici populina;* also experiments with the leaf rusts of pine, the bark rusts of pine, various species of Æcidium and of Puccinia, together with species of Gymnosporangium.

A classification of the rusts of the Umbelliferæ, C. B. PLOWRIGHT (*Gard. Chron., 3. ser., 32* (*1902*), *No. 825, p. 282*).—A brief account is given of the recent work of Lindroth on the classification of the Uredineæ known to occur on various species of Umbelliferæ. In this monograph descriptions are given of all the known species, which amount to nearly 90. The author has grouped the English species into 4 groups, based upon the proposed system of classification.

Rust of Andropogon sorghum, W. BUSSE (*Ber. Deut. Bot. Gesell., 20* (*1902*), *No. 5, pp. 281–291, pl. 1; abs. in Jour. Roy. Micros. Soc.* [*London*], *1902, No. 5, p. 592*).—The author has studied the occurrence of this fungus in German East Africa, where it sometimes causes heavy losses in the crop of millet. He has arrived at the conclusion that the fungus is that described by Cooke as *Puccinia purpurea*. The technical characters are briefly described, and the writer states that this is the same rust as that known as sorghum rust in India, which has been attributed to *P. penniseti*.

Rust of timothy, J. ERIKSSON (*Öfvers K. Svenska Vetensk. Akad. Förhandl., 59* (*1902*), *pp. 189–198; abs. in Jour. Roy. Micros. Soc.* [*London*], *1902, No. 5, pp. 592, 593*).—According to the author, the rust found on timothy is a separate and distinct species, and has been named *Puccinia phlei-pratensis*. Infection experiments have been tried by the author to trace the life history of the fungus, and after considerable difficulty the spermagonia and æcidia were produced. The author is of the opinion that the timothy rust was originally identical with *P. graminis*, but that it has become specialized on timothy and can only rarely be induced to grow on oats and rye.

The relation between host and parasite, H. MARSHALL WARD (*Ann. Bot., 16 (1902), pp. 233–315; abs. in Jour. Roy. Micros. Soc. [London], 1902, No. 5, p. 593*).—A study has been made of the relation between the brome grasses and the rust *Puccinia dispersa* that occurs abundantly on the different species of Bromus. After a general introduction the different rusts that have been found on brome grasses are discussed and an account given of the efforts made to secure the proper sterilization of plants in rust infection experiments. The methods of infection and progress of the various experiments are given in detail. Pot plants were used, and the results obtained seem to differ for the different species of Bromus. Spores taken from one species would not infect others unless they were of closely allied forms. A comparison is drawn between the germination of the uredospores and that of pollen grains as observed in attempts at cross breeding, and the author believes it possible to grow species of grasses immune to rust infection.

Concerning pure cultures of the rust Puccinia dispersa, H. MARSHALL WARD (*Centbl. Bakt. u. Par., 2. Abt., 9 (1902), Nos. 5, pp. 161–168; 6–7, pp. 242–246, figs. 3*).—During the course of a series of experiments on the relation between the host and parasite in the case of certain species of Bromus and the rust fungus *Puccinia dispersa* the author devised a simple method of obtaining pure cultures of both host and parasite which are described in detail. Inoculation experiments are described and, so far as the author's observations go, there does not seem to be any chance of infection through mycelium or other agencies within the seed. The only source of infection appears to be spores attached to the seed, as in none of his experiments was he able to discover any trace of mycelium within the seed.

A contribution to the study of cereal smuts and their prevention, C. VON TUBEUF (*Arb. K. Gesundheitsamte, Biol. Abt., 2 (1902), No. 3, pp. 437–467, fig. 1*).—Studies are reported in which, by inoculation experiments, it is shown that in the case of the stinking smut of wheat the fungus winters over as a mycelium in the young plants. So far as the oat smut is concerned, it does not appear to retain its vitality over winter in the soil. Winter oats treated with hot water and sown in infested soil were without any disease in the subsequent crop. Experiments are reported which seem to indicate that smut spores which have passed through the alimentary canal of animals retain their germinative ability to a considerable degree. Tables are given which apparently show marked differences in the susceptibility of varieties of wheat to smut diseases. The results of experiments with fungicides for the prevention of smut are reported in which seed treated with a copper-soda solution, wet and dusted with a copper-soda powder, and those treated with Bordeaux mixture gave crops nearly free from smut, while seed wet and rolled in superphosphate, copper sulphate and lime powder, and in kainit gave the worst infected crops. Negative results were obtained in experiments in which the effect of smut and rust on the health of animals was investigated by feeding the infected straw, grain, etc.

Experiments in the prevention of stinking smut of wheat, D. MCALPINE (*Jour. Dept. Agr. Victoria, 1 (1902), No. 4, pp. 413, 414*).—The results of preliminary treating of the seed grain with copper sulphate, corrosive sublimate, and formalin are shown, the different treatments completely preventing the occurrence of diseased plants. In check plats which were otherwise treated in the same manner only 5 per cent of the plants were free from disease. The effect of the different treatments on the germination of the seed is shown, corrosive treatment being the least injurious, and copper sulphate the most so of the methods tested.

Some biological phenomena of Ustilago maydis, J. GRÜSS (*Ber. Deut. Bot. Gesell., 20 (1902), No. 4, pp. 212–220, pl. 1; abs. in Jour. Roy. Micros. Soc. [London], 1902, No. 5, pp. 591, 592*).—When spore formation takes place in corn smut, the spore-forming hyphæ are said to become mucilaginous. The author has investigated this phenomenon in order to determine the possible presence of an enzym. He found an aminoxydase is present in the fungus similar to that which is found in the yeast of beer, and, as in the yeast, it is located in the vacuoles of the cells. As soon as the formation of mucilage begins in the smut, the production of oxydase is said to cease. The enzym is said to be most active when there is a maximum of metabolism in the cell, and the resting stage of the fungus follows the period of mucilaginous formation.

A new parasite of Trifolium montanum, F. Bubak (*Centbl. Bakt. u. Par., 2. Abt., 8 (1902), No. 26, pp. 817–821; abs. in Jour. Roy. Micros. Soc. [London], 1902, No. 5, pp. 586, 587*).—An account is given of *Urophlyctis bohemica*, which attacks plants of *Trifolium montanum*, causing them to be stunted in their growth and usually preventing their flowering. The leaves and petioles are covered with yellow spots and wart-like excrescences caused by the parasite. These warts are said to be much larger on the petioles than on the blade of the leaf.

The stem anthracnose of red clover, O. Kirchner (*Ztschr. Pflanzenkrank., 12 (1902), No. 1–2, pp. 10–14, figs. 2*).—In a previous publication (E. S. R., 14, p. 159) the occurrence of stem anthracnose of clover was mentioned and the cause attributed to *Glœosporium trifolii*. Subsequent investigations of the author have shown that the disease in question is not due to that fungus but to an undescribed species to which he has given the name *G. caulivorum*, n. sp. The characteristics of the disease are given and the fungus is technically described.

Urophlyctis, a fungus causing galls on the roots of alfalfa, P. Magnus (*Ber. Deut. Bot. Gesell., 20 (1902), No. 5, pp. 291–296, pl. 1; abs. in Jour. Roy. Micros. Soc. [London], 1902, No. 5, p. 586*).—Descriptions are given of galls produced on alfalfa roots which were hitherto ascribed to the presence of the fungus *Cladochytrium alfalfæ*, but which the author believes belongs to the genus Urophlyctis. The galls occur as small excrescences on the larger roots. The disease occurs in damp soil only and is fatal to the plants. It was first described by Lagerheim from Ecuador, from where it has been recently brought to Alsace.

On the parasitism of Pseudomonas destructans, M. C. Potter (*Proc. Roy. Soc. [London], 70 (1902), No. 464, pp. 392–397, figs. 2*).—Since the publication of the author's paper on a bacterial disease of the turnip (E. S. R., 13, p. 467) his investigations have been continued, and the action of the cytase and toxin upon the living cells has been studied, and he has succeeded in tracing the passage of the bacteria through the cell walls into the cell. He has found that through the secretion of cytase and a toxin the parasitic action of the bacteria is comparable with that of certain parasitic fungi. In his previous investigations the attack of the organism could always be traced to a wound, and he has since found that the bacteria do not have the power to penetrate the cuticle of the mature epidermis. The parasite can, however, readily effect an entrance into its host through the undeveloped epidermis of young and tender structures. Whether in the case of *Pseudomonas destructans* the toxin or cytase is the first excretory product it is impossible to say, but the latter produces the first visible effect and is believed to prepare the way for the rapid action of the toxin.

The root rot of taro, J. G. Smith (*Hawaii Sta. Bul. 2, pp. 21, figs. 2*).—An account is given of the causes and means for prevention of a destructive disease that threatens the extinction of the taro crop of Hawaii. The taro (*Colocasia antiquorum esculentum*) is one of the principal food plants of the native Hawaiian, and its long cultivation has apparently deteriorated the stock to a considerable extent. Wherever the taro is grown entirely under irrigation it suffers severely from the disease known as taro rot. This is characterized by the shortening and early maturing of the root stocks. It was found that the rot is readily spread by the planting of diseased suckers. It was also found that by planting suckers free from disease and securing a good circulation of irrigation water, together with the application of proper fertilizers and an occasional rotation of crop, this disease may be to a great extent prevented.

A disease of nursery stock, G. Massee (*Gard. Chron., 3. ser., 32 (1902), No. 822, p. 235, fig. 1*).—The author reports having observed in widely separated parts of England a disease of young apple and plum trees which is due to the attack of the fungus *Eutypella prunastri.* In instances cited more than 50 per cent of the entire stock was destroyed. Peach trees are subject to attacks of the same fungus, the disease on all showing well-marked characters which are easily recognized. The stem is the part attacked, and the first outward indication of disease is a slight browning of the bark which soon becomes hard, dry, and inseparable from the wood. There is no cracking or wrinkling of the surface and as a rule no further symptoms are evident during the first season of the attack. The mycelium, however, continues to grow inward, killing the cambium and young wood, thus preventing the upward flow of sap. The second season the leaf buds either do not expand at all or only imperfectly, and during the summer the branches die through a lack of food. The fungus does not appear to pass from the stem to the branches, the latter dying simply from starvation. The second year after the plant is attacked the tree is usually completely destroyed. At this time the infection of the fungus is indicated by the appearance in the dead bark of groups of minute transverse cracks which contain small clusters of the fruiting organs of the fungus. There is no appearance of anything like canker, and as the bark is not broken or disturbed in any way the superficial observer usually believes that the tree is killed by drought or some attack on the roots.

This fungus is common upon many species of rosaceous plants, and the spores produced on the wild plants usually start an epidemic of the disease in the nurseries. Although the infection sometimes takes place through punctures caused by insects, the epidemic occurrence of the disease can only be traced to infection taking place through the cut ends of twigs. The spores of the fungus mature from February to April, and it is recommended that no pruning should be done during this time. In the case of the young stem it is important that every wound made by pruning should be coated with tar or some substance that would prevent the germination of spores on the surface. Insects, especially aphids, should be held in check by means of insecticides, and wild trees in the neighborhood should be examined for the occurrence of the fungus.

Two unusual troubles of apple foliage, F. C. Stewart and H. J. Eustace (*New York State Sta. Bul. 220, pp. 217-233, pls. 5*).—During the summer of 1902 the attention of the authors was directed to a condition of apple trees over the greater portion of the State, the leaves being much wrinkled and distorted. Different varieties of apples seemed to be variously affected, the leaves being more or less covered with irregular blisters of various sizes caused by the separation of the lower epidermis from the mesophyll. It soon became evident that the blisters were in some way related to frost injury, and a review of the weather conditions showed that the spring of 1902 in New York was unusually wet and cool and there were a number of severe frosts occurring as late as May 10 and 11. Only the early leaves at the base of the shoots were affected and the most injury was observed where frosts were most severe.

The authors advance a theory for the injury which differs somewhat from that lately described by Sorauer. They claim that the leaves were frozen when only partially unfolded. The formation of ice crystals between the lower epidermis and the mesophyll caused these tissues to separate, and being removed from the source of nourishment the epidermis ceased growing while the parenchyma cells continued to expand. Not having an opportunity to spread laterally the leaf took the form of an arch, bringing about the wrinkled condition. In some cases the epidermis became ruptured and the parenchyma cells of the leaf exposed to the air died from excessive transpiration. This theory differs somewhat from that of Sorauer, who claims that the rupturing of the epidermis and death of the cells is due to the direct action of the frost.

This same phenomenon was observed on other plants, principally quince leaves, horse chestnut, cherry, etc.

Early in July apple growers in western New York became considerably alarmed at an extensive spotting, yellowing, and premature dropping of the apple leaves. A careful examination of many of the orchards showed that the trouble was primarily due to weather conditions and was greatly aggravated by spraying. Injury seemed to follow the use of all the insecticides used alone or in conjunction with Bordeaux mixture. Whether the Bordeaux mixture used alone was capable of causing the injury was not determined. The trouble was at its height about the middle of July, and by the end of the month in many orchards one-fourth to one-half the leaves had fallen from the trees. The affected leaves were more or less spotted, and late in August it was noticed that the majority of the spots were inhabited by a species of Phyllosticta, which subsequent investigations showed was closely related to *Phyllosticta pirina*. The parasitism of this fungus has never been proved by inoculation experiments, and the fact that Bordeaux mixture seems to have little effect in restricting the disease has led the authors to believe that it is not the real cause of the so-called leaf spot, but possibly the fungus is present as a saprophyte.

As a possible explanation of the injury, it is stated that when a shower is followed by bright sunshine, drops of water on the leaves act as lenses and concentrate the sun's rays to such an extent as to destroy the tissues beneath. This injury produces a condition similar to that recognized in leaf spots, and may possibly be preliminary to the presence of the fungus. In the authors' opinion a large part of the so-called apple-leaf spot is due to spray injury and weather conditions, and is not of fungus origin.

Spraying experiments in 1902 for black spot, D. McAlpine (*Jour. Dept. Agr. Victoria, 1 (1902), No. 4, p. 432*).—A brief report is given of experiments conducted for the prevention of apple scab by the use of Bordeaux mixture. The addition of linseed oil and sal ammoniac to Bordeaux mixture gave promising results.

Experiments in the treatment of apple and pear scab during 1901–2, D. McAlpine (*Jour. Dept. Agr. Victoria, 1 (1902), No. 5, pp. 525–528, pls. 4*).—The results of experiments for the prevention of black spot or scab of the apple and pear are given in detail. The relative susceptibility of different varieties is shown, and the effect of spraying with Bordeaux mixture for the prevention of this disease is indicated. The effect of a single spraying is shown by the largely increased proportion of marketable fruit, as well as the increase in the gross yield. Single applications of Bordeaux mixture made to pear trees just after the buds had opened resulted in the production of almost totally clean fruit of a variety which is ordinarily considered exceedingly subject to disease.

Experiments in the treatment of black spot of the apple and pear, D. McAlpine (*Jour. Dept. Agr. Victoria, 1 (1902), No. 6, pp. 620–630, pls. 4*).—An account is given of experiments conducted in a number of localities in Australia for the prevention of scab of apples and pears. The comparative value of Bordeaux mixture and copper-soda solution, potassium permanganate, copper acetate, and various modified formulæ of Bordeaux mixture is given. All of the treatments greatly reduced the amount of scab. The most successful fungicide used was that known as Grant's mixture. This is composed of Bordeaux mixture, to which some unknown ingredients are added.

The fungus causing black spot of the apple and pear, D. McAlpine (*Jour. Dept. Agr. Victoria, 1 (1902), No. 7, pp. 703–708, pl. 1*).—The black spot or scab of apple and pear is said to have been first observed in Australia in 1862. Since that time it has become well established throughout the country. Lists are given of varieties of apples and pears which are most subject to the attacks of the fungus, as well as those least affected. The symptoms of the disease and effects are indicated, and the life history of the fungus is briefly outlined.

Die-back of the apple, D. McAlpine (*Jour. Dept. Agr. Victoria, 1* (*1902*), *No. 6, p. 631*).—The attention of the author has been called to a disease of apple trees known as die-back. Subsequent investigations have shown that in numerous cases the trees were attacked by an agaric (*Armillaria mellea*). The abundant presence of this mushroom has led to the conviction that it is the cause of the disease locally known as die-back.

Brown rot or ripe rot of fruit, D. McAlpine (*Jour. Dept. Agr. Victoria, 1* (*1902*), *No. 7, pp. 701, 702, pl. 1*).—The effect of attacks of *Monilia fructigena* upon different fruits is shown, and for the prevention of the disease spraying with Bordeaux mixture is recommended. All diseased fruit should be collected and burned to prevent the spreading of the fungus spores.

Peach and plum rust, D. McAlpine (*Jour. Dept. Agr. Victoria, 1* (*1902*), *No. 6, pp. 617–619, pls. 2*).—A description is given of the peach and plum rust (*Puccinia pruni*) in which the most susceptible varieties of host plants are mentioned and the application of Bordeaux mixture for its prevention is recommended.

Clasterosporium carpophilum and its relation to the gummosis of stone fruits, R. Aderhold (*Arb. K. Gesundheitsamte, Biol. Abt., 2* (*1902*), *No. 5, pp. 515–559, pls. 2, figs. 6*).—A description is given of the various forms of disease produced by Clasterosporium on stone fruit trees, and a detailed characterization of the fungus when grown in natural and artificial media is given. An historical statement regarding the fungus is presented, together with its synonymy and morphology, also the results of inoculation experiments. The relation of this fungus to the so-called gummosis or gum flow of stone fruits is discussed, and the conclusion is drawn from inoculation experiments that the Clasterosporium was the cause of the appearance of gum in all the experiments, and that the general conclusion is warranted that this fungus is a prominent cause of gum flow from wounds on stone fruit trees. A brief bibliography accompanies the paper.

Variations in the appendages of Podosphæra oxycanthæ, J. G. Sanders (*Jour. Mycol., 8* (*1902*), *No. 64, p. 170, fig. 1*).—A brief note is given of variations in the appendages of the cherry powdery mildew, in which the branching of the majority of the appendages was noted.

A disease of pineapples (*Agr. News* [*Barbados*], *1* (*1902*), *No. 14, p. 213*).—A brief account is given of a disease of pineapple plants in which the younger stages of the disease are characterized by the tips of the leaves turning yellow and drying up. As the disease progresses the discoloration of the leaves proceeds further until they are more or less wilted. The symptoms pointed to an insufficient water supply, and an examination of the roots showed in many cases that they were blackened and rotten. There was an unusual development of root hairs on the old roots, and the root hairs showed the presence of the threads of a fungus. It is believed that the extraordinary development of root hairs was caused by special effort on the part of the plant to replace those destroyed by the fungus. It is suggested that wherever this disease occurs all affected plants should be dug up and burned and the soil thoroughly limed.

On the occurrence and characteristics of black rot in Dagestan, N. N. von Speschnew (*Ztschr. Pflanzenkrank., 12* (*1902*), *No. 1–2, p. 10*).—The occurrence of black rot of grapes is reported in which the characters of the disease resemble those of the ordinary black rot to a considerable extent, but the fungus causing the disease is said to be *Diplodia uvicola*, instead of the usual *Guignardia bidwellii* and *G. reniformis.*

An experiment on the treatment of gray rot of grapes, F. Boisseau (*Prog. Agr. et Vit.* (*Éd. L'Est*), *23* (*1902*), *No. 47, pp. 601–603*).—A brief account is given of spraying experiments in which fungicides containing potassium permanganate, alum, copper sulphate, and sulphur were tested. The best results were obtained with the alum fungicide, followed by that in which potassium permanganate at the rate of 125 gm. per hectoliter of water was used.

Powdery mildew and early pruning, L. Ravaz (*Prog. Agr. et Vit.* (*Éd. L'Est*), *23* (*1902*), *No. 49, pp. 668, 669*).—The value of early pruning of grapevines as a means for combating powdery mildew is mentioned and attention called to the fact that in order to be successful the affected shoots should be pruned while still carrying their leaves. Later pruning was shown by experiments to be without value.

Powdery mildew and early pruning, L. Degrully (*Prog. Agr. et Vit.* (*Éd. L'Est*), *23* (*1902*), *No. 46, pp. 570, 571*).—In an editorial note the author attests the efficacy of early pruning as a means of checking attacks of grape powdery mildew. It is recommended that grapevines be severely pruned early in the season following a destructive attack of the disease. This procedure will not obviate the use of fungicides, which should be applied later in the season.

Recent investigations in combating the plant and animal enemies of the grape, F. Gvozdenovic (*Separate from Allg. Wien. Ztg., 1902, pp. 20*).—A brief account is given of experiments conducted in combating the grape downy and powdery mildews, whether occurring singly or simultaneously upon a plant, the grape anthracnose, and the leaf rollers.

Diseases of cultivated chrysanthemums, P. Voglino (*Malpighia, 15* (*1902*), *pp. 329–341, pl. 1; abs. in Jour. Roy. Micros. Soc.* [*London*], *1902, No. 5, p. 596*).—An extended study has been made of the diseases of cultivated chrysanthemums, particular attention being given to one that has proved quite destructive to plants in Italy. The disease first appeared in July. In August and September there had not been much spread of the disease, but in the two following months it increased with great rapidity, killing many plants. The leaves were disfigured by irregular brown spots which gradually extended over the whole leaf surface. On these spots small pycnidia were formed by a fungus which the author called *Phoma chrysanthemi*. Specimens of *Phyllosticta leucanthemi* were occasionally found present, forming grayish spots, and at a later stage the Phoma was replaced by *Septoria chrysanthemi*, which continued to develop, and during the latter part of the season was the chief form of disease. By culture and infection experiments the author believes that the Phoma and Septoria are successive stages of the same fungus, and while the spores of the Phoma are short lived, the Septoria spores germinate after long intervals and are able to resist quite low temperatures.

Chlorosis in palms (*Gard. Chron., 3. ser., 32* (*1902*), *No. 822, p. 232*).—Attention is called to the rather frequent occurrence of yellow foliage in some palms, particularly Kentias. No very satisfactory explanation has been offered as a cause of this phenomenon, and as a possible explanation the writer refers to a recent announcement of Laurent in which he attributes the chlorotic condition to the fatty degeneration of the chlorophyll corpuscles. In healthy green leaves the chloroplasts are of a deep green color and there is no trace of the yellow bodies always present in cases of chlorosis. The inference is drawn that these yellow bodies result from degeneration of the chlorophyll. Some of the conditions for producing this state are said to be cultivation at low temperature with an excess of moisture, and growing plants from seed which have been gathered in an unripe condition, possibly from unhealthy plants.

Witches' brooms on the barberry, J. Eriksson (*Beitr. Biol. Pflanz.* [*Cohn*], *8* (*1902*), *pp. 3–127, pls. 3; abs. in Jour. Roy. Micros. Soc.* [*London*], *1902, No. 5, p. 592*).—The author has shown by experiment that the abnormal branch development of the barberry is due to *Æcidium graveolens*, the Puccinia form of which is found on the tall oat grass. The region of attack is the central bud of the tender rosette of leaves. According to the author, the tissue entered by the fungus is not suppressed, but is excited to a quick, strong branch development followed by a condition of weakness which renders the abnormal branches unfit to resist the cold of winter, hence these parts are especially subject to winterkilling.

Larch and spruce fir canker, G. Massee (*Jour. Bd. Agr.* [*London*], *9* (*1902*), *No. 2, pp. 176-188, pls. 3*).—A description is given of the larch canker due to *Dasyscypha calycina*, and a somewhat similar disease of the larch due to *D. resinaria*. The larch canker is due to a wound parasite, the investigations of the author not substantiating the claim of Carruthers that the fungus was actively parasitic. Out of more than 100 inoculations on unwounded branches of larch no infections were obtained, while spores applied to the wounded surface almost invariably established the disease. In nature the wounds are caused in various ways, as by wind or snow, the extrusion of sap due to late frosts, the biting and punctures of insects, particularly the larch aphis, and those made near the base of the stem in planting young trees. As a rule, when trees under 10 years of age are attacked, they are either killed outright or so deformed as to be of very inferior value. Older trees, while stunted to some extent, are not so severely injured.

The parasite causing the spruce canker is so nearly like that causing the disease just described as to be indistinguishable to the ordinary observer. The spruce is subject to infection in the same way as the larch. Seedlings and young trees should be protected with kerosene emulsion against the attacks of the larch aphis. As a safeguard against injury through late frosts, seed beds should not be placed in low-lying, damp localities, as these conditions are not only more subject to frosts but also favor the presence of the aphis. Recent investigations are said to show that the spruce-gall aphis (*Chermes abietis*) and the larch aphis (*C. laricis*) are alternate phases of the same insect. In the case of the attack upon large trees, the trunk will continue to grow and make wood for many years, but it furnishes a serious menace to surrounding trees by being a breeding place of the fungus.

Some new fungus parasites of oaks, E. Henry (*Bul. Soc. Sci. Nancy, 3. ser., 3* (*1902*), *No. 2, pp. 99–103*).—Descriptions are given of *Pseudovalsa longipes*, *Aglaospora taleola*, and of *Pezicula cinnamomea*, all of which have been recently found occurring parasitically upon oak trees.

A twig blight of willows, C. von Tubeuf (*Arb. K. Gesundheitsamte, Biol. Abt.*, *2* (*1902*), *No. 5, pp. 567–570, pl. 1*).—A twig blight of willows, due to *Fusicladium saliciperdum*, is described. The disease seems to be common on many species of willow although so far as the author's investigations go it does not affect *Salix babylonica* or *S. pentandra*. For the control of this disease the author suggests a winter wash of a solution of copper sulphate followed by spraying with Bordeaux mixture in the spring after the appearance of the leaves.

Two new leaf parasites of deciduous trees, P. Hennings (*Ztschr. Pflanzenkrank.*, *12* (*1902*), *No. 1–2, pp. 14–16*).—Descriptions are given of *Septoria caraganæ*, n. sp., which is parasitic on the leaves of *Caragana arborescens*, and of *Fusarium vogelii*, n. sp., which occurs on the leaves of the black locust.

Experiments in combating dry rot of timber, E. Henry (*Bul. Soc. Sci. Nancy*, *3. ser., 3* (*1902*), *No. 2, pp. 89–99*).—A report is given of experiments which have been made in Austria, Russia, France, and particularly of those made in connection with the forest school at Nancy, on the preservation of timber against the dry-rot fungus (*Merulius lacrymans*) by injecting or otherwise treating with various chemicals.

A contribution to the knowledge of timber dry rot, C. von Tubeuf (*Centbl. Bakt. u. Par., 2. Abt., 9* (*1902*), *No. 3–4, pp. 127–135, fig. 1*).—A number of experiments with cultures of the dry-rot fungus (*Merulius lacrymans*) are reported in which the efficiency of certain fungicides for preventing the spread of dry rot was tested. Copper solutions seemed to only slightly check the growth of the fungus and as Bordeaux mixture acted quite injuriously toward it the injury is attributed by the author to the lime and not the copper. Formaldehyde gas did not penetrate sufficiently to be of any particular service in destroying the fungus and it is not to be recommended for this purpose. It did, however, prevent the fungus spreading to other objects.

Spraying for fungus diseases, D. McAlpine (*Jour. Dept. Agr. Victoria*, *1* (*1902*), *No. 7, pp. 709–714, pls. 2, figs. 2*).—Directions are given for the preparation of Bordeaux mixture, copper-soda mixture, and copper sulphate and soft soap. For most purposes the Bordeaux mixture which consists of 6 lbs. of copper sulphate, 4 lbs. of lime, and 50 gal. of water is preferred. In order to increase the adhesiveness and spreading power of the fungicide good results have been obtained where 1 lb. of sal-ammoniac, saltpeter, or salt was added to every 50 gal. of Bordeaux mixture.

ENTOMOLOGY.

Insects notably injurious in 1902, F. L. WASHBURN (*Minnesota Sta. Bul. 77, pp. 74, pls. 9, figs. 54*).—Notes are given on the distribution of the Hessian fly in Minnesota. In combating this insect it is recommended that stubble be burned or plowed under and that screenings from thrashing machines should be fed or burned immediately. It is also recommended that wheat should not be planted on the same ground for 2 years in succession. The chinch bug is said to be distributed chiefly in the southern portion of the State. Attempts to destroy this insect in small experimental plats of wheat by sowing millet as a trap crop and by fumigation with bisulphid of carbon were unsuccessful. Spraying with kerosene emulsion killed a large percentage of the bugs. The use of parasitic fungi in killing chinch bugs has been abandoned on account of the inefficiency of this method. For preventing attacks of the insects the use of tar bands or furrows provided with post holes at regular intervals is recommended.

The chief grasshopper injuries during the year were due to *Melanoplus atlanis*. A number of other species were somewhat injurious. The author recommends the passage of a law compelling all landowners to plow under all stubble found to contain grasshopper eggs. Large numbers of grasshoppers were destroyed by the use of hopperdozers. Notes are given on the methods of constructing these machines. Mention is made of a number of insect, bird, and other enemies of grasshoppers. The chief bird enemies in Minnesota are prairie chickens, hawks, blackbirds, crows, and meadow larks.

Attempts to prevent the attacks of horn fly by means of rancid lard were ineffective. Lard mixed with oil of pennyroyal, oil of Eucalyptus, or with pyrethrum or kerosene proved to be effective for 2 or 3 days. Fish oil is even more effective but is not recommended for dairy cows on account of its disagreeable odor.

Harpalus pennsylvanicus is reported as injuring strawberries. It is suggested that the beetles may be caught by means of lantern traps. Lawns were quite badly injured by *Lachnosterna rugosa*. For treatment of lawns, fumigation with bisulphid of carbon is recommended. This may be accomplished by means of a small air-tight box. Notes are also given on woolly aphis, alder blight, stalk borer, *Liggrus gibbosus*, mosquitoes, cockroaches, carpet beetles, blister beetles, plum gouger, tarnished plant bug, melon aphis, corn louse, and New York weevil. Experiments with kerosene in combating mosquitoes were only partly successful. It was found that Phinotas oil in the proportion of 1 part to 12,000 parts of water killed the larvæ and pupæ of mosquitoes.

Notes on injurious insects, G. LÜSTNER (*Ber. K. Lehranst. Wein, Obst, u. Gartenbau, Geisenheim, 1901, pp. 161–174, figs. 7*).—The author calls attention to a number of observations which have been made on the subject of the influence of severe winters upon the numbers and multiplication of injurious insects. During the past few years *Zephus compressus* and *Blastodacna hellerella* have been unusually injurious to various fruit trees. *Boarmia gemmaria* is noted as an important enemy of grapevines, and notes are also given on *Calocampa exoleta* and on lantern traps for use in catching injurious insects.

Insects and their relation to agriculture, W. E. BRITTON (*Connecticut State Bd. Agr. Rpt. 1901, pp. 193–207*).—Brief notes on the damages caused by insects, on beneficial insects of various kinds, and on San José scale, oyster-shell bark-louse, scurfy bark louse, codling moth, celery caterpillar, gypsy moth, maple borer, etc.

Some common insect pests of the farmer, H. T. FERNALD (*Pennsylvania Dept. Agr. Bul. 99, pp. 32, figs. 8*).—Notes on the habits, life history, and means of combating Hessian fly, wheat-stem maggot, army worm, wireworm, Angoumois grain moth, codling moth, apple-tree tent caterpillar, round-headed apple-tree borer, plum curculio, peach-tree borer, peach-twig borer, and plant lice.

Economic entomology, H. TRYON (*Queensland Agr. Jour., 11* (*1902*), *No. 6, pp. 403–405*).—Brief mention is made of insects injurious to apples and other deciduous fruits, citrus fruits, mango, grape, coffee, strawberry, potato, and other garden and field crops as well as ornamental and shade plants.

Economic entomology, C. FULLER (*Agr. Jour. and Min. Rec.* [*Natal*], *5* (*1902*), *No. 18, pp. 573–581*).—The author discusses briefly the duties of economic entomologists and gives brief notes on some of the more important economic insects, including ticks, locusts, and corn worms.

Insect epidemics (*West Indian Bul., 3* (*1902*), *No. 3, pp. 233–236*).—Notes are given on the well-known frequent occurrence of certain insects in unusual numbers. Such an outbreak was recently observed in the West Indies in the sweet-potato worm (*Protoparce cingulata*). Notes are also given on the unusual outbreaks of other insects, with a brief account of the causes of these outbreaks.

Notes on the Ixodidæ, L. G. NEUMANN (*Arch. Parasit., 6* (*1902*), *No. 1, pp. 109–128, figs. 6*).—A number of new species and genera of this family are described, including species of Ixodes, Rhipicephalus, and Hæmaphysalis, as well as the new genus Ceratixodes. Descriptive and biological notes are also given on a number of other well-known species of this family.

The berseem worm, G. BONAPARTE (*Jour. Khedir. Agr. Soc. and School Agr., 4* (*1902*), *No. 6, pp. 229–231*).—*Agrotis segetum* attacks a number of farm crops in Egypt, including cotton, wheat, barley, maize, millet, potato, and berseem. The eggs are laid at very different seasons and there are at least 2 broods per year, 1 in spring and the other in autumn. The remedies suggested for controlling this insect are thorough cultivation of the soil, destruction of weeds, rolling the ground, flooding the berseem crop, and the application of gas lime.

The melon plant louse and the "manteca" disease, J. J. THORNBER (*Arizona Sta. Rpt. 1902, p. 264*).—This insect is said to cause the manteca disease by excessive secretion of honeydew. Spraying, in order to be practical, should be done when the vines are small, before the whole field has become infested.

The codling moth and apple scab (*Gard. and Field, 28* (*1902*), *No. 14, pp. 157–168, figs. 16*).—A general account of the codling moth and apple scab, partly compiled from American literature on these subjects and partly based on the experience of apple growers in Australia. The habits and life history of the codling moth are described in detail and notes are given on the methods which have proved most successful in combating this insect. The methods most strongly recommended are banding, training the trees low, and spraying with arsenicals.

Scale insects of the West Indies, H. MAXWELL-LEFROY (*West Indian Bul., 3* (*1902*), *No. 3, pp. 240–270*).—The author presents in this paper a list of the scale insects observed in the smaller West Indian islands. According to the author the islands may be classed, zoologically, into 3 groups—Greater Antilles, Lesser Antilles, and Trinidad and Tobago. Biological and economic notes are given on about 75 species observed in these islands.

Winter treatment and summer treatment of San José scale, J. DEARNESS ET AL. (*Ontario Dept. Agr. Spec. Rpt., 1902, Oct. 28, pp. 4*).—The commissioners inspected the work which had been done under the direction of Mr. Fisher in the destruction of the San José scale. It was found that summer treatment for the scale had prevented its increasing rapidly and spreading from tree to tree. The best results were obtained from the use of kerosene emulsion containing 1 part of oil to 6 parts of water emulsified with whale-oil soap at the rate of ½ lb. per gallon of oil. During experiments in winter treatment of the scale 6 forms of remedies were tried: Lime-sulphur-salt wash prepared according to 3 formulæ, kerosene emulsion, whale-oil soap, and hydrocyanic-acid gas. All of these remedies gave satisfactory results, but the best treatment was found to be the application of a lime-sulphur wash, in the proportion of 30 lbs. lime and 15 lbs. sulphur in water sufficient to make 30 gal.

Lime, salt, and sulphur wash, J. B. Smith (*New Jersey Stas. Bul. 162, pp. 8, figs. 2*).—The author presents a brief historical account of the use of California wash in the eastern States. Experiments conducted by fruit growers in New Jersey indicate that for moderately infested trees this remedy is as effective as any other which can be used. On some badly infested trees the wash did not prove as effective as could have been desired. The formula used in New Jersey is as follows: Lime 50 lbs., sulphur 50 lbs., salt 50 lbs., water 150 gal. It is recommended that the application be made in late winter or early spring before the trees have started to grow, and it is believed that there is no advantage in spraying twice a year.

The effect of carbon bisulphid upon scale insects, especially the San José scale, J. Moritz (*Arb. K. Gesundheitsamte, Biol. Abt., 3 (1902), No. 2, pp. 130–137*).—In this series of experiments the author made use of imported American apples which were infested with San José scale. The apples were fumigated in a zinc-lined chest. As a result of experiments with carbon bisulphid it was found that at temperatures varying from 15.4 to 21.5° C. this substance killed from 75 to 100 per cent of the scale insects and eggs when allowed to operate for from 2 hours and 5 minutes to 5 hours and 25 minutes, at a strength represented by 0.9 gm. to 2.3 gm. per liter of space. Observations made on infested apples indicated that San José scale might remain in a living condition for an indefinite period on apples maintained in storage at a temperature varying from 11.5 to 14.5° C.

Experiments concerning the effect of hydrocyanic-acid gas on scale insects, especially upon the San José scale, J. Moritz (*Arb. K. Gesundheitsamte, Biol. Abt., 3 (1902), No. 2, pp. 138–147*).—Experiments were conducted with hydrocyanic-acid gas upon a number of fruit trees received from Japan and upon American apples infested with San José scale. The fruit trees and apples were fumigated in a zinc-lined box containing 308 liters of space. It was found during these experiments that when 3 to 6 gm. of cyanid of potash was used and when the generated gas was allowed to operate for from 1 to 2 hours at different temperatures the treatment proved insufficient for destroying all of the San José scale. It is believed, therefore, that further experiments must be tried before the reliability of this treatment for destroying San José scale can be determined.

Instructions for the treatment of San José scale, W. M. Scott (*Georgia State Bd. Ent. Bul. 5, pp. 12, fig. 1*).—The author presents in a brief form the recommendations previously made (E. S. R., 14, p. 589), together with certain additional suggestions. It was found that the California wash is exceedingly effective in destroying the San José scale, and that next to this remedy petroleum oils are most effective.

The Indian wax scale as an orchard pest, and its control, W. W. Froggatt and W. J. Allen (*Agr. Gaz. New South Wales, 13 (1902), No. 9, pp. 919–922, pl. 1*).—Notes are given on the biology and economic relations of *Ceroplastes ceriferus* which attacks the blackthorn bushes of Australia, as well as persimmon trees and other economic trees. A number of fruit growers have been successful in destroying these scale lice by spraying with a solution of washing soda. When used in the proportion of 1½ lbs. to 4 gal. of water the washing soda destroys the scale and causes no damage to the foliage. Experiments were also conducted for destroying this insect by fumigation with hydrocyanic-acid gas. Great success is reported from the use of this remedy. Some trees which were badly infested were apparently freed from the pest. Brief notes are also added on fumigation for red scale and other scale insects.

The limitations of parasites in the destruction of scale insects, W. W. Froggatt (*Agr. Gaz. New South Wales, 13 (1902), No. 11, pp. 1087–1093*).—The author presents a general description of the value of the natural enemies of the scale insect. Attention is called to the controverted points concerning the importance of predaceous insects and fungus diseases in the destruction of injurious insects. The author believes that the effectiveness of parasites is limited in all cases and that only a minor significance can be ascribed to the natural enemies of scale insects in controlling the ravages of the latter.

The red spider of citrus trees, C. W. Woodworth (*California Sta. Bul. 145, pp. 19, figs. 5*).—Complaints having been received of injuries caused by red spiders on citrus trees, an investigation was made of this subject. It was found that the species concerned was *Tetranychus mytilaspidis*. Notes are given on the habits and life history of the mite and the species is described in detail in all its stages. The chief natural enemies of this mite are ladybirds, lace-winged flies, predaceous mites, a species of Coniopteryx, and a fungus disease. Coniopteryx appears to be the most important natural enemy of the red spider. It works entirely upon the egg of the mite, the larvæ being in constant search for the eggs of the red spider, which are punctured as soon as found. Experiments in combating the red spider indicate that fumigation is of no value; that sulphur is not as effective as it is for the red spider of deciduous trees; and that while spraying is a difficult operation and best done both from the inside and outside of orange trees, good results may be expected from the use of sulphid of potash. This material was prepared according to the following formula: Potash 32 lbs., sulphur 37 lbs., salt 2 lbs., water 50 gal. It was found that the red spider does not cause the spots on citrus fruits, as has been supposed, but injures the leaves, and when present in large numbers causes a dropping of the fruit.

The orange bark weevil (*Agr. News [Barbados], 1 (1902), No. 18, p. 280*).—A species of Cryptorhynchus was found attacking orange trees in Granada and is believed to be present in other parts of the West Indies. A brief description of the insect in its different stages is given. The larvæ or pupæ may be killed in the bark with a knife, or the trunk of the trees may be painted with a preparation containing crude carbolic acid, whale-oil soap, and clay.

The mosquito blight of tea, H. H. Mann (*Planting Opinion, 7 (1902), No. 50, pp. 847–851*).—The insect which causes mosquito blight of tea in India is *Helltisope theivora*. It is a plant bug and the eggs are deposited in the green stalks or weeds. The insect passes the winter in both the adult and egg stages. The eggs are deposited in various positions, so that it seems impossible to control the species by severe pruning in early spring. Experiments in stimulating the growth of tea and in irrigating the plants for the purpose of controlling this insect were not very effective. The best results were obtained from applications of kerosene emulsion in the spring. The applications were made about 3 or 4 weeks before pruning.

The coffee borer in Usambara, F. Stuhlmann (*Ber. Land u. Forstw. Deutsch-Ostafrika, 1 (1902), No. 2, pp. 154–161, pl. 1*).—The insect discussed in this note is *Anthores leuconotus*. A brief account is given of the life history of the species and a description is presented of the insect in its different stages. It is suggested that remedial measures should include destruction of larvæ by burning infested trees, the capture of adult beetles, and the destruction of the young larvæ by poisoning the trunks.

Report on a trip to the region of Mkamba for the purpose of infecting grasshoppers with the grasshopper fungus, Lommel (*Ber. Land u. Forstw. Deutsch-Ostafrika, 1 (1902), No. 2, pp. 176–181*).—An extensive trip was made by the author for the purpose of locating swarms of grasshoppers and trying infection experiments by means of the grasshopper fungus. In many localities it was found impossible to practice this method with success. The information which was obtained from the natives regarding the depredations of grasshoppers and the direction taken by swarms in their flight was in many instances unsatisfactory. In some cases the grasshoppers appeared to be killed off in large numbers by the fungus.

The guinea-grass moth (*West Indian Bul., 3 (1902), No. 3, pp. 238–240*).—*Remigia repanda* is said to have caused severe injury to *Panicum maximum*. Notes are given on the appearance of the insect in its different stages and on its life history.

The "green page" moth (Cydimon leilus) (*West Indian Bul., 3 (1902), No. 3, pp. 236–238*).—Descriptive biological and economic notes are presented on this insect, which appeared in immense numbers in Trinidad during the autumn of 1901.

Notes and practical suggestions concerning recognition and methods of combating animals which are injurious to cultivated crops and fruits in the field and in storehouses, G. DEL GUERCIO (*Nuove Relaz. R. Staz. Ent. Agr., 1. ser., 1902, No. 4, pp. 497, figs. 284*).—This publication is in the nature of a handbook of injurious insects, worms, crustaceans, etc. The following subjects are discussed: The value and practical importance of economic entomology; the various insecticides which are used and methods of preparing them; machines and apparatus used in combating insects and other noxious animals; worms injurious to cultivated plants, and mollusks which have been found to be of economic importance in agriculture. The main part of the publication is occupied with a detailed biological and economic account of the various species of mites and insects which injure cultivated plants in Italy.

Experiments concerning the effect of insecticides and fungicides upon plants treated with these substances, J. MORITZ (*Arb. K. Gesundheitsamte, Biol. Abt., 3 (1902), No. 2, pp. 103–129*).—In the experiments reported in this article the author tested the effect of bisulphid of carbon and copper sulphate on plants. The experiments with bisulphid of carbon were made in a zinc-lined box of 1,201.5 cc. contents. The plants which were fumigated in this box included a number of flowers and weeds, and also certain trees, including apple, pear, cherry, plum, and conifers. Some of the plants were in pots and others were removed from the pots and freed from soil as far as possible. The results of these experiments are presented in detailed tabular form. It was found that at temperatures varying from 12.9 to 24.8° C. carbon bisulphid exercised no injurious effect upon plants which were exposed to it for a period varying from 30 minutes to 4 hours, at a strength represented by 14 to 71.8 gm. carbon bisulphid vaporized in a space containing 1,147 cc. On the other hand, all the fruit trees were killed by exposure for 24 hours at a temperature of 9.3 to 19.9° C. to a strength of carbon bisulphid represented by 150.2 to 162.2 gm. carbon bisulphid vaporized in a space containing 1,147 cc.

In experiments with copper sulphate a number of plants, including pear, plum, apple, and cherry, were dipped in solutions of this substance. The solutions contained from 0.5 to 1 per cent copper sulphate, and the temperature of the solutions was 14° C. The plants were immersed in the solution for from 2 to 3 hours. It was found that the apple trees bore this treatment best and that the pears and plums were most injured. The plants which were cut back before the treatment suffered more than those which were not thus mutilated.

A list of North American Lepidoptera and key to the literature of this order of insects, H. G. DYAR (*Smithsn. Inst., U. S. Nat. Mus. Bul. 52, 1902, pp. XIX + 723*).—In this bulletin the author presents a list of the known species of Lepidoptera of North America. The work is intended to replace Smith's List of Lepidoptera of Boreal North America, published in 1891. The classification adopted is based largely on the author's views, and synonyms are given in all cases, together with references to literature. The number of species listed is 6,622. An index of species, genera, and families is appended to the bulletin.

The origin of the natural coloration of the silk of Lepidoptera, D. LEVRAT and A. CONTE (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 17, pp. 700–702*).—The authors sprinkled neutral red, methylene blue, and picric acid on the food of

Attacus orizaba and *Bombyx mori* in order to test the effect of these coloring matters upon the silk produced. It was found possible to influence the color of silk by the pigment matters used, the influence being exercised through the agency of the blood.

Observations on termites, or white ants, G. D. HAVILAND (*Smithsn. Inst. Rpt. 1901, pp. 667, 678, pls. 4*).—Notes are given on the anatomy, classification, and biology of various species of white ants, especially Malayan, South African, and Bornean species.

Mosquito development and hibernation, J. W. DUPREE and H. A. MORGAN (*Science, n. ser., 16* (*1902*), *No. 417, pp. 1036–1038*).—Brief notes are given on the results of the authors' observations upon a number of species of mosquitoes. It is concluded from these observations that boat-shaped masses of eggs are not general, that the eggs of most species sink when the water is agitated, and that the eggs hatch when separated and shaken to the bottom. It was also found that the hatching of the eggs is irregular and may be postponed for a longer period as the result of the drying up of pools. The larval period may be much prolonged by insufficient food supply and low temperature. It is considered quite exceptional for any mosquitoes, including *Culex sollicitans*, to deposit eggs elsewhere than in water.

Observations on the Anopheles in the suburbs of Paris, EDMOND and ÉTIENNE SERGENT (*Ann. Inst. Pasteur, 16* (*1902*), *No. 12, pp. 940–946*).—Notes are given on the species of Anopheles and other mosquitoes found in the vicinity of Paris. The habits and life history of these species are discussed. A reference is made to the natural enemies of the mosquitoes as determined by aquarium experiments and under natural conditions. Attention is called to the difficulty of determining the duration of the life of the larvæ and pupæ on account of the great variations due to different external conditions.

A study of Anopheles on the Isthmus of Suez, CAMBOULIU (*Compt. Rend. Acad. Sci. Paris, 135* (*1902*), *No. 17, pp. 704–706*).—Brief descriptive and economic notes on 3 species of Anopheles, 2 of which are not named, while the third is *A. pharoensis*.

Beekeeping and the drought, A. GALE (*Agr. Gaz. New South Wales, 13* (*1902*), *No. 10, pp. 1036–1038*).—On account of the unusual drought in New South Wales during the years 1901 and 1902, great difficulty was experienced in producing sufficient quantities of bee plants for a satisfactory honey yield. Brief notes are given on the extra care and precautions which may be required in preventing the development of disease among the weakened swarms.

Silk—its origin, culture, and manufacture (*Florence, Mass.: The Nonotuck Silk Co., 1902, pp. 53, figs. 38*).—Brief notes are given on the discovery and introduction of silk, the culture of silkworms, and the reeling and other processes connected with the manufacture of silk.

Silk culture, G. MCCARTHY (*North Carolina Sta. Bul. 181, pp. 54, figs. 15*).—A revised form of an article already referred to from another source (E. S. R., 13, p. 876).

Statistics of bees, honey, and wax (*Twelfth Census United States, Census Repts., vol. 6* (*Agriculture, pt. 1*), *pp. CCXXXII–CCXXXVII*).—Brief notes are given on the history of the introduction of bee raising into this country. According to the present census there are in the United States 4,109,626 swarms of bees, with a value of $10,186,516. The total production of honey in 1900 was 61,196,160 lbs., of wax, 1,765,315 lbs., which together represented a value of $6,664,904.

FOODS—NUTRITION.

The baking quality of flour and its estimation, G. HAMANN (*Inaug. Diss., Univ. Jena, 1901, pp. 122*).—Comparative studies of the different methods of estimating the baking quality of wheat flour are reported and a method proposed which depends on the fact that the nitrogenous material in different sorts of wheat varies as regards its solubility in 70 per cent alcohol containing 1 per cent of acetic acid. Some of the conclusions which were drawn follow: The baking quality of wheat flour is determined by the gluten content, especially by the composition of the gluten. The physical characteristics of the gluten depend upon the relative proportions of its constituents. It appears that it is possible to show a definite relation between the power to absorb water and the baking quality of flour, but the quality is not shown by water absorption alone. There is no direct relation between the porosity of bread and the absorptive power of the flour. Chemical changes take place in the wheat berry and in wheat flour on storing. These depend on changes in the gluten, which apparently have a great effect upon the baking quality, though their nature is not understood. The total nitrogen content of flour ground from winter wheat grown under different conditions varies within wide limits.

The baking quality of wheat flour and its determination, G. Hamann (*Die Backfähigkeit des Weizenmehles und ihre Bestimmung. Heidelberg: Carl Winter, 1902, pp. 120*).—A reprint of the above.

The relation between protein content and baking quality, R. Reichert (*Inaug. Diss., Halle, 1902, pp. 72; Fühling's Landw. Ztg., 51 (1902), Nos. 16, pp. 565–579; 17, pp. 605–625; 18, pp. 645–660*).—Using flour from wheats containing different amounts of gluten, a number of baking experiments were made. The nitrogenous constituents of the flour and other milling products and of original wheat were studied by a modification of Fleurent's method, which is described. In some of the experiments separated gluten, glutenin, and gliadin were added to the flour in such a way as to modify the gluten content arbitrarily, and it was found that the baking qualities were correspondingly modified. One of the special objects of the investigation was to study the fitness of different sorts of flour for the manufacture of the small German breakfast rolls. The author compares his results with those obtained by other investigators and discusses the subject of bread making at length. Among the conclusions drawn were the following: The amount of bread produced by a given flour depends upon the amount of water which it will absorb. This is in turn dependent upon the total amount of gluten present. The increase in bulk during fermentation and baking of the dough—that is to say, the volume of bread produced—is determined by the absolute quality of gliadin present. The gliadin content of the flour can be very low and the flour still be such that the bread is not injured, 7 to 8 per cent being regarded as a maximum and 6 per cent as a minimum for good bread. If the gluten content is excessive, the bread becomes porous and the crust browns too quickly during baking. Skill in bread making has a great deal to do with the quality of the bread produced. The color of the interior of the baked product depends upon the color of the flour used.

The baking quality of flour and baking experiments with flour and gluten, H. Sellnick (*Ueber Backfähigkeit der Mehle und Back-Versuche von Mehl und Kleber. Leipzig, pp. 16*).—In this article, which is reprinted from the *Deutscher Müller*, the author discusses some of the earlier experiments which have to do with the baking quality of flour and briefly reports his own work on the subject, giving especial attention to a description of the Artopton, a form of apparatus which he has devised for use in determining the baking quality of flour.

Grain, flour, and bread, A. Maurizio (*Getreide, Mehl und Brot. Berlin: P. Parey, 1903, pp. XIII + 393, pls. 2, figs. 139*).—In this volume, which according to the author is designed as a laboratory handbook and for the special use of chemists, millers, bakers, botanists, and agriculturists, the botanical, chemical, and physical properties and the hygienic relations of grain, flour, and bread are discussed, as well as methods of judging and testing these characteristics. Milling, baking, and the other subjects included in the volume are exhaustively treated of, the results obtained by many investigators being cited, as well as data drawn from the author's own work.

Experiments on the baking qualities of wheat flour (*Deut. Landw. Presse, 29 (1902), No. 91, p. 741, figs. 3*).—A descriptive article based on A. Maurizio's experiments (p. 785).

Experiments with flour and grain, A. MAURIZIO (*Landw. Vers. Stat., 57 (1902), No. 5-6, pp. 405-417, pls. 2*).—The distribution of gluten in grain is discussed on the basis of microscopical studies. The author also considers the absorption of odors and gases by flour and milling products, and reports determinations showing that 1,114 to 1,991 cc. gas were contained in a kilogram of flour. Directions are given for detecting the presence of *Acarus farinæ* in flour.

The Artopton, H. SELLNICK (*Das Artopton. Leipzig-Plagwitz: E. Stephan [1902], pp. 16, figs. 7*).—The author describes an apparatus which he has devised for use in determining the baking quality of flour. It consists of a flat plate over a water bath heated by a spirit flame and covered with a bell jar. On the plate the samples of dough are placed to rise, and may also be cooked.

Slimy bread, J. KÖNIG (*Fühling's Landw. Ztg., 51 (1902), No. 22, pp. 823-827*).—The causes of slimy bread are discussed, and analyses reported which were made to show the changes in chemical composition of wheat bread due to the micro-organisms causing this condition. Results obtained with rye bread are also briefly noted. According to the author, micro-organisms convert some of the insoluble protein into soluble compounds, among which albuminose, peptones, amido compounds, and ammonia were recognized. That the cleavage goes so far that free nitrogen is produced is regarded as probable. Definite conclusions regarding fat were not drawn. A considerable proportion of the starch was rendered soluble, that is, it was converted into dextrin and sugar, which were further oxidized to carbon dioxid and water. Some acetic and lactic acids were also formed from carbohydrates. The pentosans underwent cleavage, but the crude fiber and the mineral matter were not affected. The slimy material, the author believes, is derived from the outer membrane of the bacteria themselves.

Fruits and fruit products: Chemical and microscopical examination, L. S. MUNSON, L. M. TOLMAN, and B. J. HOWARD (*U. S. Dept. Agr., Bureau of Chemistry Bul. 66, pp. 114, pls. 12*).—Analyses are reported of a number of samples of fresh fruits and of jams, jellies, canned fruits, and similar products made in the laboratory under known conditions, as well as commercial products gathered with the object of securing fairly representative samples. The analytical methods followed are described and discussed. The term "jam" is applied to all fruit products in which the pulped fruit is reduced to the consistency of jam, and thus includes what are often termed marmalades. It was found that the use of these terms varied considerably in different parts of the country.

Of the 96 samples of jams analyzed, 86 were commercial products and 10 were prepared in the laboratory. Eighteen samples of the commercial jams contained no glucose, 53 contained glucose but were not so labeled, and the remaining 15 were purchased as compound goods. Of the 58 samples of jelly analyzed, 44 were commercial products and 14 were prepared in the laboratory. Nineteen of the former contained no glucose, 13 contained glucose but were not so labeled, and the remaining 12 were purchased on the market as compound goods. Seventy-four samples of canned goods were examined, 39 samples of which were put up in glass, one in a stone jar, and the remainder in tin cans. The use of artificial coloring matter was found to be confined to fruits in glass. In discussing this class of goods the authors make the following statements:

"The customs of different firms differ so widely regarding the relative character of fruit packed in tin and glass that generalizations are difficult. It may be said, however, that the lowest grade of products is preserved in tin. Pie peaches, restaurant goods, and soaked goods (canned dried fruit) are prepared for a market that demands cheap products. It is necessary to choose the least expensive package available. In addition to this, the appearance of these articles would not be inviting in glass.

"In high-grade fruits, on the other hand, some canners place exactly the same products in glass and tin. Again, the expense of shipping bottled goods, both on account of breakage and freight rates, practically prohibits the preservation in glass of even high-grade goods that are to be shipped to a great distance, and many firms pack all their fruit in tin even for local markets. The average quality of tinned fruit is inferior to that preserved in bottles, and the lowest quality of the former is far below that of the latter."

Seven samples of brandied fruits and 3 of fruit butter were also analyzed, as well as 3 samples of solid marmalades, 2 of the latter being prickly pear products obtained in Mexico.

Letters are included in the bulletin which were received from a number of manufacturers in connection with many of the points discussed. The technique of the microscopical examination of fruits and fruit products is discussed and results of such examinations illustrated by a number of figures.

The manufacture of preserved foods and sweetmeats, A. HAUSNER (*London: Scott, Greenwood & Co., 1902, pp. VIII + 223, figs. 28*).—The causes of decomposition and fermentation are discussed, and different methods of preserving animal and vegetable foods are described in this volume, which is translated by A. Morris and H. Robson from the third German edition.

Preliminary report on the composition of cacao butter, J. KLIMONT (*Ber. Deut. Chem. Gesell., 34 (1901), p. 2636; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 23, p. 1164*).—A chemical study of the fats contained in cacao butter.

Milk powder in Germany, O. J. D. HUGHES (*U. S. Consular Rpts., 71 (1903), No. 268, p. 78*).—A brief note describing a milk powder of German origin. The composition is quoted.

New food materials, RÜHLE and J. KÖNIG (*Chem. Ztschr., 1 (1902), Nos. 6, pp. 152–154; 7, pp. 179, 180*).—The authors discuss the composition and nutritive value of proteid foods prepared from skimmed milk and other sources, meat extracts, predigested foods, and similar products.

A contribution to the chemistry of fatigue, H. W. HARPER and MARGARET HOLLIDAY (*Jour. Amer. Chem. Soc., 25 (1903), No. 1, pp. 33–47*).—A study of the phenomena of fatigue and breathlessness, apparently resembling the effects of caffein in toxic doses, led the authors to investigate the metabolism of nitrogen and the renal excretion of phosphorus, sulphur, and chlorin when severe muscular work was performed. The subject was a healthy student, and the experiment was divided into 3 periods of 3 days each. During the middle period the subject performed excessive muscular work, which consisted of hurdle racing continued until he fell exhausted. The first and third were rest periods. The food and excretory products were examined.

The average amount of nitrogen consumed per day during the 3 periods was 17.06, 15.50, and 16.73 gm., respectively. The average daily outgo in the urine was 15.70, 16.25, and 15.17 gm., and the corresponding amounts excreted in the feces 0.99, 0.40, and 0.64 gm. Thus there was an average daily gain of 0.37 gm. during the first period of rest, an average daily loss of 1.15 gm. during the period of overexertion, and an average daily gain of 0.92 gm. during the final rest period. The authors studied the nitrogenous constituents of the urine as well as the chlorin, and the phosphoric and sulphuric anhydrids excreted during the different periods. The excretion of phosphoric anhydrid was greatest during the first period and least during the third period. The sulphuric anhydrid was greatest during the work period and least during the third period. The reverse was observed with chlorin.

The authors believe that their results show the presence of methyl derivatives of xanthin in the urine, due to the severe muscular work, but consider additional experiments necessary before deductions can be drawn. They propose, therefore, to continue the investigations.

Experiments on the metabolism of nitrogen, sulphur, and phosphorus in the human organism, H. C. SHERMAN (*U. S. Dept. Agr., Office of Experiment Stations Bul. 121, pp. 47, dgms. 3*).—The digestibility of a simple mixed diet, and the income and outgo of nitrogen, sulphur, and phosphorus were studied in 10 experiments of which the author was the subject. The comparative digestibility of liberal and restricted diet and the effects of loss of sleep were also studied. The diet consisted of bread (crackers) and milk, with butter added in some of the tests. The author regards additional experiments necessary before final deductions can be drawn, but summarizes the principal results as follows:

"The proportions of protein digested from a restricted diet were about 0.7 per cent higher than those digested from a liberal diet of the same composition.

"Marked loss of sleep for 3 successive nights resulted in a small increase in the amounts of nitrogen, sulphur, and phosphorus excreted. The increase of sulphur was proportional to that of nitrogen, and the increase of phosphorus was very slightly larger, the relative difference being no greater than might be attributed to the usual daily variations. The increased elimination resulting from loss of sleep did not appear until the third day, while changes resulting from alteration of the diet were always perceptible on the first day.

"The data collected regarding the relative 'lag' of nitrogen, sulphur, and phosphorus are not yet sufficient to permit general conclusions to be drawn.

"In general the metabolism and 'balance' of sulphur ran approximately parallel with that of nitrogen. The renal elimination and 'balance' of phosphorus showed fluctuations similar to those of nitrogen, but not so closely parallel as in the case of sulphur. The elimination of phosphorus by the intestine was large and variable, making the accurate separation of the feces an important factor in the determination of the phosphorus balance."

The results attending the use of a diet sufficient for maintenance but poor in protein, B. H. JÄGERROOS (*Skand. Arch. Physiol., 13 (1902), No. 6, pp. 375–418*).—The author reports experiments with dogs in which the animals lived for a number of months on a diet furnishing as low as 0.2 gm. nitrogen per kilogram body weight and finally died from some infectious disease. The balance of income and outgo of nitrogen was determined. The diet after a time was not relished and the dogs with difficulty could be induced to eat it, which in the author's opinion showed that it was not satisfactory. He holds that if a daily diet fulfills hygienic requirements, is sufficiently abundant, palatable, easily digested, composed of fresh materials, and of suitable volume, no special attention need be paid to the protein content, as a sufficient amount will undoubtedly be furnished.

The excretion of carbon dioxid and water by man through the skin, E. A. VON WILLEBRAND (*Skand. Arch. Physiol., 13 (1902), No. 6, pp. 337–358, figs. 3*).—In the experiments reported the body of the subject was inclosed in a metallic box or chamber, the head protruding through the top. There were devices for drawing a current of air through this chamber and collecting and analyzing it, the apparatus and methods being described. From the author's experiments he concluded that the excretion of water through the skin during absolute rest is moderate and is proportional to the temperature of the surrounding air, increasing from 12° C. to the point at which the temperature is great enough to cause perspiration. An abundant secretion of perspiration is observed between 30 and 33° C. The amount of carbon dioxid excreted through the skin remains constant at a temperature of from 20 to 33° C., during absolute rest being equal to 7 or 8 gm. in 24 hours. If the temperature rises to such a point that perspiration is induced, the amount of carbon dioxid increases suddenly to 3 or 4 times its former value. The author's investigations do not show how carbon dioxid is excreted through the skin, but he offers the suggestion that some of this gas, which is present in the blood, reaches the surface of the body by diffusion. He discusses also the source of the water excreted as perspiration.

Does the diet have an effect upon the excretion of carbon dioxid when muscular work is performed? J. E. Johansson and G. Koraen (*Skand. Arch. Physiol., 13 (1902), No. 3–5, pp. 251–268*).—Continuing the experiments noted above, the authors studied the effect of diet upon muscular work as shown by changes in the respiratory quotient. Some of the principal conclusions which were drawn follow: The results of these experiments, showing a decreased amount of carbon dioxid excretion during muscular work as a consequence of the diminished glycogen content of the body, indicate that when fat is a source of muscular energy it is not first converted into carbohydrates, as has been suggested. The carbon dioxid excreted during work and rest, when sugar, protein, and fat were consumed and also after fasting, was greater than the amount when work was performed and the glycogen in the body had been exhausted by fasting and muscular work. The authors note that sugar or protein added to the diet affected the excretion of carbon dioxid in a manner entirely different from what would be expected from the amount of muscular work. This phase of the subject is discussed. According to the authors, when the glycogen of the body is exhausted, muscular exertion and internal muscular work increase the cleavage of body fat. From the experiments it appears possible to maintain at a constant height for a number of hours the increased carbon dioxid excretion caused by consuming nutrients, provided the nutritive material is taken repeatedly in small portions. These and other deductions are discussed at length.

The work of the digestive glands, J. P. Pawlow, trans. by W. H. Thompson (*London: Charles Griffin & Co., 1902, pp. 208; rev. in British Med. Jour., 1903, No. 2194, pp. 151–153*).—This volume summarizes the author's experiments on the physiology of digestion.

Pancreatic secretion, Bayliss and Starling (*Jour. Physiol., 1902, Sept.; abs. in British Med. Jour., 1902, No. 2191, Epit., p. 96*).—The occurrence of a body called "secretin" is noted, which the authors state is secreted in the epithelium of the small intestines and is carried by the blood to the pancreas, where it causes a flow of pancreatic juice. The investigations reported are a contribution to the subject of the physiology and pathology of pancreatic secretion and digestion.

Concerning the utilization of glycerin in the body and its estimation in urine, H. Leo (*Arch. Physiol. [Pflüger], 93 (1902), No. 5–6, pp. 269–276*).—In the experiments described a man consumed from 8.93 to 26.76 gm. glycerin per day and no disturbance of metabolic processes or of digestion was observed. When larger amounts of glycerin were consumed a portion was excreted in the urine. This was not the case with the smaller doses. According to the author 0.29 gm. glycerin per kilogram of body weight is retained in the body. Reasons are given for believing that the glycerin retained in the body does not come from the cleavage of fats. Analytical methods are described.

Calculating the cost and nutritive value of army diet, Schumburg (*Deut. Mil. Ärztl. Ztschr., 1901, No. 8–9, p. 522; abs. in Hyg. Rundschau, 12 (1902), No. 22, p. 1172*).—The subject is discussed and a dietary standard proposed, which is based on an estimated energy requirement of 3,000 calories per man per day, of which 400 calories are to be supplied by protein and 500 by fat.

General mess manual and cookbook for use on board vessels of the United States Navy (*Washington: U. S. Navy Dept., 1902, pp. 32*).—In this publication, which was prepared under the direction of the Paymaster-General of the U. S. Navy Department, the organization and administration of the general mess of the Navy is discussed, as well as the establishment and administration of commissary stores, and related topics. A number of recipes are given for the preparation of the food served the enlisted men in the Navy.

Home science cookbook, Mary J. Lincoln and Anna Barrows (*Boston: Home Science Pub. Co., 1902, pp. X+281*).—A large number of recipes are given for dishes suitable for different meals. The value of the various classes of foods is discussed, and menus suggested for each month of the year.

International catalogue of scientific literature. Q—Physiology (*Internat. Cat. Sci. Lit., 3 (1902), pt. 1, pp. XIII+404*).—The literature indexed in this volume, which is part 1 of the physiology volume for 1901, comprises general physiology, physiological chemistry, including foods, the physiology of the different systems, pharmacology, experimental psychology and pathology, and related topics. The volume corresponds in character to those for chemistry and botany already noted (E. S. R., 14, pp. 632, 637). W. A. Osborne is referee.

ANIMAL PRODUCTION.

Forage crops, R. H. FORBES and W. W. SKINNER (*Arizona Sta. Rpt. 1902, pp. 268–270*).—Analyses are reported of bran, Egyptian corn (leaves, stalks, and grain), almond hulls, native saltbushes (*Atriplex nuttallii* and *A. lentiformis*), wheat hay, and alfalfa hay. A number of these follow:

Composition of a number of feeding stuffs.

Samples.	Water.	Protein.	Ether extract.	Nitrogen-free extract.	Crude fiber.	Ash.
Egyptian corn:	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Leaves	6.15	10.06	1.72	46.45	23.81	11.81
Stalk	6.00	3.69	3.43	47.78	31.61	7.49
Grain	8.21	13.13	4.79	70.47	1.61	1.79
Saltbush, *A. nuttallii*	5.20	11.69	2.16	51.02	20.55	9.38
Saltbush, *A. lentiformis*	6.11	7.81	1.99	52.31	27.05	4.73
Almond hulls	4.81	5.50	3.23	60.33	17.33	8.80

The almond hulls or pericarps, which are discarded in preparing almonds for the market are sometimes used as fuel. According to the authors, it has been observed that horses will learn to eat them and they are apparently a fattening feed.

"The analysis shows this material to be rich in nitrogen-free extract, which includes sugar, starch, and other carbohydrate foods, while poor in protein. It would doubtless be good economy in the occasional instances where almond hulls are available, to teach farm stock to consume this novel though valuable food, due regard, however, being had to the presence, as shown in our sample of 7.34 per cent of tannin in the air-dry material. Tannin in large amount is stated to be an intestinal irritant, making caution advisable in using a foodstuff of this nature."

Inspection of feeding stuffs, W. H. JORDAN, C. G. JENTER, and F. D. FULLER (*New York State Sta. Bul. 217, pp. 187*).—Analyses made under the provisions of the State feeding stuff law are reported of a number of samples of cotton-seed meal, oil meal, linseed meal, gluten meal and feed, germ oil meal, distiller's grains, barley sprouts, malt sprouts, mixed feeds, and cereal breakfast food by-products, corn meal, poultry feeds, animal meal, and similar products.

Licensed concentrated feeding stuffs, F. W. WOLL and G. A. OLSON (*Wisconsin Sta. Bul. 97, pp. 48*).—In accordance with the provisions of the State feeding stuff law, analyses were made of a number of samples of cotton-seed meal, oil meal, gluten meal and feeds, hominy feed, corn feeds, corn bran, corn hearts, mixed corn and oat feeds, oat clippings, sugar food, cereal breakfast food by-products, calf meal and other dairy feeds, blood meal, granulated bone, beef meal and similar poultry feeds; wheat bran and middlings, alone and mixed, wheat shorts, red-dog flour, wheat germs, dust, screenings and damaged wheat, rye bran, middlings, and shorts; oat shorts, meal, and hulls; barley feed and sprouts, dried malt and brewers' grains; buckwheat bran, middlings, and shorts, flaxseed meal, rice bran, pigeon grass seed, spent hops, and several mixed grains and feeding mixtures.

The origin of fat in the animal body, G. Rosenfeld (*Chem. Ztg., 26 (1902), No. 93, p. 1110*).—In a paper presented before the Chemical Society of Berlin the author reported metabolism experiments which, in his opinion, showed that the formation of fat from protein in the animal body is not demonstrated. He believes that fat in food passes into the body tissue without much change and that fat is formed from carbohydrates which apparently has a low content of oleic acid.

The rolê of salt in animal feeding, A. Dissard (*Rev. Agr. Réunion, 8 (1902), No. 11, pp. 444–448*).—In this article, which was quoted from *Agriculture Nouvelle*, the importance of salt is discussed, as well as the amounts which should be fed, and related topics.

The adipolytic ferment in the stomach, F. Volhard (*Ztschr. Klin. Med. [Berlin], 43 (1901), pp. 397–419; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 20, pp. 969, 970*).—According to the author the digestive juice of the stomach contains a ferment which causes cleavage of fat and the extract of the mucous membrane of the stomach contains the zymogen of this ferment. The properties of both of these bodies are discussed.

Concerning the ferment in the mucous membrane of the pylorus, F. Klug (*Arch. Physiol. [Pflüger], 92 (1902), No. 6–7, pp. 281–292*).— A number of experiments are reported.

Influence of the spleen on the assimilation of nitrogen, I. Byelgooski (*Zap. Novo-Alexandri Inst. Selsk. Khoz. i. Lyesov., 14 (1901), No. 1, pp. 205–211*).—Experiments made with dogs in which the income and outgo of nitrogen was determined, showed that the removal of the spleen did not materially affect the assimilation of this element.—P. FIREMAN.

Experiments on feeding animals carried on in Seine-Inférieure in 1901, F. Laurent (*Compt. Rend. Cong. Soc. Aliment. Rat. Bét., 6 (1902), pp. 53–61*).—Feeding tests with steers, milch cows, and sheep are reported in which the value of commercial concentrated feeds was studied. In the first test, which was made by Prunier, 12 steers, divided into 4 lots of 3 each, were fed linseed cake, gluten cake, sesame cake, and decorticated peanut cake, in addition to a coarse fodder. In the 56 days of the test the total gains made were 78, 86, 85, and 87 kg. per lot, and the corresponding cost of a kilogram of gain was 14.4, 9.8, 10.6, and 13.2 cts. The conclusion is drawn that all the cakes were satisfactory and that their selection should be determined by market prices.

The comparative feeding value of wheat bran, decorticated cotton-seed cake, decorticated peanut cake, and sesame cake was tested by Luquet with 4 lots of 4 cows each. Each cow was fed 3 kg. of the concentrated feed in addition to a basal ration of 12 kg. fodder beets, 1 kg. chaffed straw, and 10 kg. meadow hay per head. In 56 days the total quantity of milk produced by the 4 lots was 2,333.5, 2,462.0, 2,494.5, and 2,473.5 liters, respectively. During the feeding period lots 1, 3, and 4 lost respectively 58, 38, and 24 kg. in weight, and lot 2 gained 116 kg. In the author's opinion the tests showed that it is profitable to use concentrated feeds like those tested. The cotton-seed cake proved to be especially satisfactory, securing an abundant flow of milk of first quality and maintaining the cows in good condition.

Using 6 lots of 5 sheep each, E. Brayé tested the comparative value of maize, colza cake, decorticated cotton-seed cake, sesame cake, peanut cake, and linseed cake. The basal ration consisted of 1 kg. oat straw, 0.5 kg. chaffed straw, 5 kg. fodder beets, and 1 kg. alfalfa rowen per head per day. During the first two-thirds of the tests, which covered 60 days, each sheep was fed 500 gm. per day of the concentrated feed, and during the last third of the period 600 gm. per day. At the beginning of the test the average weight of the sheep varied from 259.5 kg. for lot 1 to 311 kg. for lot 6. The total gain of the 6 lots was 29.5, 21, 21, 21.5, 13.5, and 14 kg., respectively. Rating the value of the gains in weight at 20 cts. per kilogram, the gains ranged in value from $2.70 with lot 5 to $5.90 with lot 1. According to the author, full-grown sheep require for fattening a ration with a wide nutritive ratio, better results being obtained when the ratio was 1:8.5 than when it was 1:4 or 1:5. Commercial concentrated feeds are regarded as useful for fattening sheep and the choice must be determined by their relative cost. Such feeding stuffs should supplement a quantity of coarse fodder sufficient to maintain a regular action of the digestive functions.

Alfalfa *v.* sorghum for wintering calves, E. A. BURNETT (*Nebraska Sta. Bul. 75, pp. 3-9, figs. 2*).—The author reports 2 tests on the feeding of young beef cattle. In the first the relative value of alfalfa and sorghum was tested with 3 lots of calves, lots 1 and 2 containing 6 grade Herefords each and lot 3 containing 6 grade Shorthorns. After a preliminary period of 2 months, during which all the calves were fed on mixed grass and clover pasture and later given some alfalfa hay and grain (corn, bran, and oats 2:1:1), the experiment proper began on December 1 and covered 141 days. Lots 1 and 2 were fed 6 lbs. per head of alfalfa hay per day and lot 3 the same amount of sorghum hay. All the lots were fed at first 5 lbs. of corn, oats, and bran, 2:1:1, per head daily, the amount being gradually increased to 8 lbs. At the beginning of the test all the calves averaged 339 lbs. in weight. The average gain of the 3 lots during the test was 236 lbs., 244 lbs., and 218 lbs. per calf, the total grain eaten being 1,032 lbs. per head and the total hay 1,183 lbs. In other words, there was a gain of 22 lbs. per calf in favor of alfalfa hay over sorghum hay.

In the second test, which was made to compare pasturage with and without grain, the animals mentioned above were rearranged in 2 lots so that each contained one-half of those previously fed the alfalfa and the sorghum rations. Two Aberdeen-Angus steers of about the same weight were also included in the lot fed grain. Lot 1 was kept from May 1 to November 1 on a 16-acre pasture containing brome grass, mixed grasses, and 3 acres of alfalfa. On account of drought the feed was poor during a part of the time. Lot 2 also had the run of a pasture and throughout the test was fed in addition at first corn meal only and later corn and bran 3:1, the total amount of corn meal eaten being 1,893 lbs. and of the bran 260 lbs. The average gain in the lot on pasture only was 292 lbs. and in the lot receiving grain in addition to pasturage it was 404 lbs. The steers were sold for slaughtering, those in lot 1 being regarded by an expert as worth $4 per 100 and those in lot 2 $5.75 per 100. The estimated profit in lot 1 was $2.01 per animal. With the Herefords in lot 2 it was $5.39 per head, and with the Aberdeen-Angus steers in this lot, $5.56 per head. According to the author this experiment shows that when steers are to be marketed in the fall or early winter there is more profit in summer feeding grain in addition to pasturage. Where steers are to be winter fed on grain for a spring market, there is more profit to feed no grain when on pasture.

Raising calves for beef production—skim milk *v.* sucking dam, E. A. BURNETT (*Nebraska Sta. Bul. 75, pp. 24-30, fig. 1*).—To study the effects on the growth after weaning of calves fed skim milk as compared with those allowed to run with their dams, 2 lots of 3 animals each, formerly included in a test comparing skim milk and whole milk (E. S. R., 13, p. 174), were fed for 63 weeks, the tests being divided into 3 periods of 147 days each. During the first period all were fed 789 lbs. alfalfa hay and 896 lbs. grain (corn and bran, 3:1). During the second period the steers were pastured and fed per head daily 8 lbs. of corn, oats, and bran, 2:1:1. At the end of this period one of the animals previously fed whole milk was withdrawn from the experiment. The remaining 5 were fed corn, oats, and bran, 2:1:1, in addition to alfalfa hay and roots, the total amount of corn eaten being 2,575 lbs., hay 1,538 lbs., and roots 1,015 lbs. During the first period the average gain of the skim-milk calves (lot 1) was 292 lbs. per head and that of the whole-milk calves 343 lbs. During the second period the average gains were 280 and 250 lbs. per head, respectively, and during the third period 332 and 335 lbs. Considering the test as a whole, the average gain of the 2 lots was the same, namely, 903 lbs. per head. In other words, the character of the feed before weaning did not exert a marked influence on subsequent gains.

The feeding was continued with 1 animal from each lot for 7 months on a ration of mixed grain and alfalfa hay, these materials being consumed by the skim-milk steer in the proportion of 6.9:1 and by the other steer in the proportion of 6.1:1. The total gains made were 345 and 325 lbs., respectively, the feed eaten per pound of gain being 13.17 and 13.94 lbs. At the close of the test the steers were exhibited at a stock show in Chicago. The skim-milk steer sold for $7.65 per 100, the other was awarded 2 prizes. According to the author this steer "during the last 2 years of his life required 6.6 lbs. of grain to produce 1 lb. of gain and less than 10 lbs. of total food to produce a pound of gain, not counting the food secured during 358 days on pasture. This record would tend to show that finished cattle can be economically produced if they are so fed that they continue to make good gains up to the time when they are finished. . . . This steer is a conspicuous example of the effect of good blood in improving the common cattle of the country."

Raising calves with skim milk, C. H. ECKLES (*Missouri Sta. Bul. 57, pp. 52, figs. 2, dgms. 2*).—Raising calves on skim milk is discussed with special reference to local conditions, the author summarizing the matter as follows:

"The calf should be taken away from its mother by the third day, or earlier. The calf should have its mother's milk for about 2 weeks. The proper amount to feed a calf the first 2 or 3 weeks is about 5 or 6 qts. per day, and no more can be given without danger of indigestion. As the calf grows older it will take more, but never should have more than 8 or 9 qts. per day. The milk must be fed always at about blood heat. Cold milk will almost always cause scours if fed a young calf. When the calf is about 3 weeks old the milk ration is gradually changed to skim milk, using about a week to make the change."

The value of skim milk for feeding pigs and poultry is also discussed, the work of a number of stations being cited.

Wintering calves on roughness, E. A. BURNETT and H. R. SMITH (*Nebraska Sta. Bul. 75, pp. 31, 32*).—The value of adding grain to a winter ration of alfalfa and prairie hay (4:1) was tested with 2 lots of 6 Aberdeen-Angus steers, averaging nearly 500 lbs. in weight. Lot 1 received only the hay and lot 2 grain in addition. The average gains during the 91 days of the trial were 100 and 185 lbs., respectively, lot 1 requiring 14.87 lbs. of hay per pound of gain and lot 2 7 lbs. of hay and 1.9 lbs. of grain, the cost of a pound of gain in the 2 cases being 6 cts. and 4.66 cts., respectively, and the calculated net profit $4.74 and $5.73. According to the author the test shows that "it is ordinarily more economical to feed a small grain ration even when good gains can be secured on hay alone."

Results of calf-feeding tests at the Kleinhof-Tapiau Experiment Station and Dairy School, HITTCHER (*Landw. Wchnbl. Schleswig-Holstein, 52 (1902), No. 45, pp. 868-871*).—The comparative feeding value of raw and cooked milk with and without the addition of salts was tested. The salts selected were such as would restore the curdling power of milk. The milk was cooked by passing live steam into it. Lot 1, made up of 6 calves, was fed raw milk; lot 2 (7 calves), cooked milk; lot 3 (6 calves), cooked milk with 10 cc. of 20 per cent of common salt solution added per liter; lot 4 (3 calves), cooked milk with 1 cc. of 40 per cent calcium chlorid solution per liter; lot 5 (3 calves), cooked milk with 2 gm. of powdered calcium citrate per liter; and lot 6 (2 calves), cooked milk with 5 cc. of 12 per cent solution of monocalcium phosphate per liter. The test covered 10 weeks. The calves ranged in weight at the beginning from 26 to 73.5 kg. each. The amount of milk which the author calculates was required per kilogram of gain in weight in the 6 lots was as follows: 11.11, 10.82, 10.45, 13.40, 11.06, and 12.18 kg., respectively. According to the author these results do not substantiate the idea often held that calves require more cooked than raw milk to produce a given amount of gain. The addition of common salt to cooked milk is regarded as satisfactory, and calcium chlorid was regarded as the least satisfactory of the salts tested.

Fattening steers, T. SHAW (*Minnesota Sta. Bul. 76, pp. 225–265*).—Several problems connected with the fattening of steers were studied in the 3 feeding tests reported. The first trial, covering 140 days and divided into 5 periods of 4 weeks each, was carried on during the winter with 3 lots each containing 2 steers. Those in lot 1, according to the author, possessed "what may be termed a fairly good beef form." Those in lot 3 were large and somewhat rangy, i. e., they were not of the type most suitable for fattening, while those in lot 2 were intermediate in type. The steers weighed about 1,100 lbs. each. The 3 lots were fed the same mixture of bran, ground barley, and ground corn, with oil cake in addition during the last 3 periods. They were also fed 20 lbs. of corn silage per head daily and all the hay they would eat up clean. The average daily gain was: Lot 1 (beef type), 1.62 lbs.; lot 2 (rangy steers), 1.61; and lot 3 (intermediate type), 1.72 lbs.; and the cost of a pound of gain was 4.8 cts., 4.49 cts., and 4.9 cts., respectively. Practically the same amount of feed was eaten per head per day by all the steers. The estimated profit was $8.41, $5.04, and $3.21, respectively.

"In this experiment the steers of the approved meat-producing types did not show any superior capacity to make increase over those possessed of more or less undesirable form, though similarly bred. Notwithstanding [this fact], there is more profit in finishing steers of the approved types, owing to the greater value relatively of the finished product.

"It is extremely probable there is also less profit in growing animals of undesirable types up to the fattening period, because of their smaller value relatively when thus far grown. The greater value of steers of the approved type as compared with those opposite in character and possessed of essentially similar blood is owing to the superior value of the meat in the carcass rather than to greater power to make increase."

In the second test a lot of 5 steers was fed for 84 days (6 periods of 2 weeks each) what the author regards as a forcing ration, and a second lot of 5 steers was fed for 140 days (5 periods of 4 weeks each) a ration containing the same kinds of feed but in different proportions, the object being to study the relative merits of long and short feeding periods. The grain ration of both lots consisted of bran, ground corn, and oil cake, the proportion varying in the different lots and in the different periods. At the beginning of the trial it was planned to feed 10 lbs. of grain per head daily to the steers in lot 1, and increase the amount to 20 lbs. during the last period. It was further planned to feed 8 lbs. of grain at the beginning to lot 2 and increase the amount to 12 lbs. at the close. All the steers were also fed as much timothy hay and clover as they would eat and in addition for 42 days they were given 20 lbs. of corn silage per head per day. It was found that the steers in lot 1 could not consume the full allowance of grain. On the other hand, the animals in lot 2 ate all the grain supplied, but "as they suffered somewhat from scouring while the silage was being fed to them, this of course hindered the gains that would otherwise have been made."

In the 12 weeks they were fed the steers in lot 1 consumed 14.2 lbs. of grain, 10.3 lbs. of hay, and 8.6 lbs. of silage per head daily. In the same time those in lot 2 ate 8.9 lbs. of grain, 11.1 lbs. of hay, and 8.4 lbs. of silage. During the remainder of the time they were fed the average amount of grain eaten was 11.5 lbs. per head and the hay 15.7 lbs. At the beginning of the trial the steers in lot 1 weighed 1,153 lbs. on an average and those in lot 2 weighed 1,212 lbs. The average daily gain per head in lot 1 was 1.3 lbs. and in lot 2 it was 1.4 lbs. The cost of a pound of gain in lot 1 (fed the forcing ration for a short period) was 8.9 cts. In the case of lot 2 the cost of a pound of gain for a corresponding period was 5.82 cts., or for the test as a whole 6.19 cts. The steers were sold for slaughtering, the profit in the 2 lots being $3.25 and $10.02 per steer.

According to the author, when steers were fed a forcing ration of grain for a short period the increase in weight was not proportional to the amount eaten owing to the fact that more or less of the meal fed was wasted. It was observed that these steers were more apt to be off their feed than those fed a lighter grain ration. In general the author considers that feeding the light grain ration for a long period was much more satisfactory than feeding the forcing ration for a short period.

In the third test, which covered 5 periods of 28 days each, the comparative merits of feeding in stables and open sheds were studied with 2 lots, each containing 7 grade Shorthorn steers of good quality, weighing on an average 1,583.3 and 1,503.9 lbs. each, respectively. Both lots were fed corn, bran, oats, and oil cake in addition to hay, the kind and amount of grain varying somewhat in the different periods. In general the object was to decrease the amount of bran and increase the amount of corn as the test progressed. The amount of oats fed was small and they were discontinued before the close of the trial. Oil cake was introduced in the second period, and the amount fed was increased as the test progressed. The steers in lot 1, fed indoors, gained on an average 1.74 lbs. per head daily and those in lot 2 (fed in a shed with a yard) gained 2.26 lbs., the cost of a pound of gain being respectively 6.47 and 5.61 cts. On an average the steers in lot 1 ate 11.31 lbs. of hay and 13.36 lbs. of grain per head daily. Similar values for lot 2 were 10.74 lbs. and 16.21 lbs. The steers were sold for slaughtering, the average profit per steer in lot 1 being $8.38 and $10.10 in lot 2. Further experiments are regarded as necessary before definite conclusions can be drawn.

Wheat *v.* **corn in a ration for fattening steers,** E. A. Burnett and H. R. Smith (*Nebraska Sta. Bul. 75, pp. 10–18*).—After a preliminary period of 4 weeks, wheat v. corn was studied with 20 steers used in a test above reported (p. 792), divided into 4 lots in such a way that there were 6 animls in lot 1 and 4 in lot 4, while lots 2 and 3 each contained 5. The test began November 1, and covered 23 weeks, being divided into 2 periods of 11 and 12 weeks, respectively. During the first period lots 1 and 3 were fed wheat and bran, 4:1, and lots 2 and 4 corn and bran in the same proportion, all the lots being given alfalfa hay in addition. In the second period lots 1 and 3 were fed wheat, corn, and oil meal, 7:1.5:1.5, and lots 2 and 4 corn, wheat, and oil meal 7:1.5:1.5, all receiving in addition alfalfa hay, prairie hay, and wheat straw about in the proportion of 2:1:1. At the end of the first period 2 steers in lot 1 and 1 in lot 2 were withdrawn for use in class room instruction. Considering the test as a whole the average gain per steer in the 4 lots was 294, 279, 349, and 326 lbs., respectively; the total grain eaten 2,248, 2,248, 2,425, and 2,424 lbs., respectively, and the total coarse fodder 1,397, 1,397, 1,392, and 1,397 lbs., respectively. On an average it was calculated the steers fed wheat required 11.85 lbs. of feed per pound of grain, and those fed corn 12.48 lbs. The steers were sold and slaughtered, the dressed weight of lots 1 and 2 being 64.48 per cent of their live weight and that of lots 3 and 4 being 62.28 per cent.

"During the period when alfalfa only was fed as roughness the steers were often in too laxative a condition to produce the best results, and the addition of prairie hay and wheat straw in the ration overcame this trouble in the second period of the experiment. . . . This one experiment is not conclusive evidence that wheat exceeds corn in feeding value, but indicates that the feeding values of wheat is 5 per cent greater than corn for cattle.

"This experiment indicates that a 6-months' feeding period in this case is more profitable than a 12-months' feeding period, [and] shows a profit of $10.14 per head on summer-fed yearling cattle compared with $19.63 on cattle of the same quality which were on grass only during the summer [p. 792]. Taking the statement for the year, the cattle fed 12 months show a profit of $15.49 against a profit of $21.64 on the cattle fed grain during the winter only.

"The steers were followed by 20 pigs weighing 1,370 lbs. at the beginning of the test. In addition to what they could gather they were fed a total of 2,878 lbs. of shorts, making a gain of 1,340 lbs. The estimated net profit on the pigs was equal to $72.17."

Comparison of shelter and rations in feeding steers, E. A. BURNETT (*Nebraska Sta. Bul. 75, pp. 19–23*).—The test proper, which was undertaken to study the importance of shelter, was begun after a preliminary period of 17 days, with 18 steers divided into 3 equal lots. The animals in lot 1 were each kept in a small yard having an open shed facing east, those in lot 2 in box stalls opening toward the south, and those in lot 3 in a single open yard with an open shed which faced south and with some protection on the north also. During the preliminary period the steers were all fed alfalfa hay and corn meal. During the 23 weeks of the test proper they were given alfalfa hay and grain, the steers in lots 1 and 2 receiving 8 lbs. of grain and from 12 to 16 lbs. of alfalfa hay per head daily. Those in lot 3 were fed first 6 lbs. of grain and 16 lbs. of alfalfa hay per head daily, the grain ration being increased and the hay ration diminished until in the latter part of the feeding period the grain amounted to from 16 to 20 lbs. and the hay to from 5 to 10 lbs. Two of the steers in lots 1 and 2 and all those in lot 3 were fed corn meal only, the grain ration of 2 animals each in lots 2 and 3 consisting of corn meal and oats 3:1, and of the remaining 2 animals in each of these lots of corn meal and bran 3:1. At the beginning of the test proper the average weight of the steers in lot 1 was 918 lbs. and of those in lots 2 and 3 it was 860 lbs. The average gain of the steers fed in open pens and sheds was 330 lbs., of those fed in open box stalls 400 lbs. and of those fed in a large open yard with a shed 315 lbs. Considering the gains with relation to the rations, the 10 steers on corn meal made an average gain of 372 lbs., the 4 steers on corn meal and oats 327 lbs., and the 4 on corn meal and bran 381 lbs., the total feed consumed per pound of gain ranging from 8.08 lbs. in the case of one of the steers fed corn meal in a box stall to 13.8 in the case of a steer fed in a shed with a yard on a corn-meal ration.

The steers were sold for slaughtering, yielding a profit of $3.16.

"In these feeding operations, as in all feeding, the large gains proved to be the cheapest gains, and these were not made by any one ration. All the extremely large gains were made by steers in the box stalls in the shed. . . . In this experiment corn meal and alfalfa in the box stall gave the largest gain. Corn meal, bran, and alfalfa in the box stall gave the second largest gain. Corn meal, bran, and alfalfa in the open shed and pen gave the third largest gain."

Dehorning fattening steers, G. H. TRUE (*Arizona Sta. Rpt. 1902, pp. 259, 260*).—Twenty-one range steers and 6 heifers were dehorned with clippers. The average loss of weight in a week was 75 lbs. per head. One steer which had not been dehorned lost 20 lbs. in the same time. The next day after dehorning cresylic ointment and pine tar were applied to the wounds of all but one of the animals. "A week later the one not treated had worms in both sides of her head, while amongst those treated only one had worms. All were given a second treatment and no further trouble was had."

Cattle, H. J. MONSON (*Jour. Khediv. Agr. Soc. and School Agr., 4 (1902), No. 2, pp. 69–74, pls. 13*).—An illustrated description of some Egyptian cattle, the subject being discussed with a view to securing improvement in local stock.

Fattening lambs, T. SHAW (*Minnesota Sta. Bul. 75, pp. 193–224, figs. 8*).—Three experiments, which have to do with fattening lambs for market, are reported. In the first the relative merits of feeding range lambs and range wethers were studied with 1 lot of 20 wethers and 4 lots containing 30 lambs each. The wethers (lot 1) were Merino grades. The lambs in lots 2, 3, and 4 were, respectively, Cotswold, Oxford Down, and Shropshire grades. Those in lot 5 were essentially of Merino blood. The test began October 31 and covered 18 weeks, being divided into 5 periods, the last covering 2 weeks and all the others 4 weeks each. Uncut hay, cut sorghum, and different mixtures of bran, unground corn and oil cake were fed. Considering the test as a whole, the wethers consumed 2 lbs. of grain and 1.5 lbs. of coarse fodder per head per day, and the lambs on an average 1.5 lbs. of grain and 1 lb. of coarse fodder. At the beginning of the trial the wethers weighed on an average 100.8 lbs. and the lambs 66.4 lbs. The average daily gain of the wethers was 0.24 lb. and of the lambs 0.23 lb., in the latter case the amounts ranging from 0.2 with lot 5 to 0.24 with lots 3 and 4. In the case of the wethers the cost of a pound of gain was 4.99 cts. and in the case of the lambs the amount varied from 3.6 cts. with the Oxford grades to 4.07 cts. with the Merino grades, averaging 3.81 cts. The average profit per lamb was 38 cts. and per wether 3 cts. The fact is pointed out that although the wethers consumed 40 per cent more feed than the lambs their increase in weight was but 3.4 per cent greater. According to the author, while the difference in relative adaptability for fattening of the lambs of the different lots "was not very great, it was the lowest in the lambs of the Merino grades."

In the second test the value of a ration of corn and bran with and without oats was tested with 16 Dorset lambs divided into 2 equal lots, the lambs in the 2 lots weighing respectively 90 lbs. and 88 lbs. each. The test covered 3 periods of 28 days. Throughout the test lot 1 was fed bran and corn in different mixtures, and lot 2 bran, corn, and oats, both lots receiving clover hay in addition. The average amount of grain eaten per head daily by all the lambs in both lots was 1.5 lbs. and the hay 0.8 lb. The average daily gain per head of the lambs fed bran and corn was 0.1, and of those fed oats in addition 1.5 lbs., the cost of a pound of gain in the 2 cases being 8.62 and 6.28 cts. At the close of the test the lambs were sold for slaughter, the net profit per lamb in the 2 lots being $1.83 and $1.97, respectively. As pointed out by the author, the lambs fed oats in addition to corn and bran gained 36 per cent more in weight during the test than the others, although they consumed practically the same amount of feed. The profit on these lambs was also greater, although their ration was somewhat more expensive. The conclusion is therefore drawn that "with prices in reasonable balance, bran, corn, oats, and hay make a more satisfactory ration for lambs that are being fattened than bran, corn, and hay."

Sixteen Dorset grade lambs, divided into 2 equal lots, were used for the third test, which was undertaken to study the comparative merits of well-balanced and badly balanced rations. The test was divided into 3 periods of 4 weeks each. The grain ration of lot 1 consisted of unground corn and bran, and that of lot 2 of unground corn, oats and barley, and bran, the proportion in each case varying in the different periods. Both lots were fed corn fodder, and in addition lot 2 was fed sliced mangelwurzels and carrots on alternate days. At the beginning of the trial the average weight of the lambs in the 2 lots was 93 and 96.9 lbs., respectively. The average daily gain of the lambs in lot 1 was 14.8 lbs. and of those in lot 2 (fed the better balanced ration), 25.1 lbs., the cost of a pound of gain being 7.17 cts. and 6.92 cts., respectively. On an average the lambs in lot 1 ate 1.9 lbs. of grain and 1.8 lbs. of corn fodder per head per day, while those in lot 2 ate 2.1 lbs. of grain, 1.7 lbs. of corn fodder, and 4.9 lbs. of roots. Shortly after the test the lambs were slaughtered, the average net profit in the 2 lots being 34 cts. and 49 cts., respectively. The author believes that "the finished product resulting from feeding mixed grain and roots was superior to that from feeding corn and bran without roots. A diet of grains with roots added, notwithstanding its greater cost, may be more economical when fattening lambs than a diet more restricted as to the grain factors composing it, in spite of the greater relative cheapness of the latter.

"In this experiment the ration composed of bran, corn, oats and barley, field roots and corn fodder, was more satisfactory than one composed of bran, corn, and corn fodder only."

Hand-feeding sheep, F. B. GUTHRIE (*Agr. Gaz. New South Wales, 13* (*1902*), *No. 10, pp. 1049–1051*).—Detailed statements are made concerning the rations fed to ewes, rams, and lambs during the recent local drought, and concerning the cost of feeding.

Hand-feeding stock in the Moree District, E. R. SCOTT (*Agr. Gaz. New South Wales, 13 (1902), No. 10, pp. 1051-1053*).—The experience of a number of sheep feeders is reported. Among the feeding stuffs tested during the drought were molasses and prickly pear. It was found that when steamed sufficiently to destroy the spines the latter would sustain life, but would not cause animals to put on flesh.

How far should sheep be hand-fed in times of drought before their value is exceeded? W. C. DOWLING (*Agr. Gaz. New South Wales, 13 (1902), No. 9, pp. 923, 924*).—The problem of successfully feeding sheep under local conditions in times of drought when they can not get their feed on the range is discussed.

Salt for sheep (*Abs. in Agr. Jour. and Min. Rec. [Natal], 5 (1902), No. 11, p. 361*).—The value of salt for sheep is indicated by a feeding experiment made in France with 3 lots fed alike on a ration of hay, straw, potatoes, and beans for 124 days. Lot 1 was given no salt. One-half ounce per head daily was fed to lot 2, and 0.75 oz. per head daily to lot 3. The sheep in lot 2 gained 4.5 lbs. per head more than those in lot 1, and 1.25 lbs. more than those in lot 3. The conclusion was drawn that too much salt can be given as well as too little. The sheep fed salt produced 1.75 lbs. more wool and had a better fleece than those given no salt.

The improvement of pasture as tested by sheep (*Dept. Agr. Cambridge Univ. Rpt. 1902, pp. 28-38*).—Continuing previous investigations (E. S. R., 13, p. 483), experiments are reported in which the value of different manures for pastures was studied by the gains made by sheep pastured on test plats. In the experiment in Cambridgeshire the sheep receiving 0.95 lb. per head daily of linseed cake pastured on a plat not manured made an average weekly gain of 2.37 lbs. Those pastured on plats which the previous year were manured with 0.5 ton basic slag, with 0.25 ton basic slag, and with 7 cwt. superphosphate per acre gained per head per week, respectively, 1.35, 2.34, and 2.41 lbs. The corresponding gain of sheep on an unmanured plat was 1.35 lbs.

In the experiment carried on in Essex, one plat was unmanured; another was unmanured, but the sheep pastured on it were fed 1.75 lbs. linseed cake per head per day. The other plats were manured respectively with 10 cwt. basic slag, with 5 cwt. basic slag, with 7 cwt. superphosphate, and with 7 cwt. superphosphate plus 100 lbs. of sulphate of ammonia per acre. Eight sheep were pastured on all the plats except the last, and on this there were only 6. The average monthly gains per lot during the 4 months' test were 4.25, 21.75, 15.25, 6.25, 8.5, and 11.75 lbs., respectively.

In the experiment in Norfolk, one plat was unmanured. Another was also unmanured, but the sheep pastured on it were fed per head daily 1 lb. of linseed cake and rough cotton-seed cake, 1:1. The other plats were manured with 0.5 ton basic slag, with 14 cwt. superphosphate, with 14 cwt. superphosphate and 3.5 cwt. kainit, and with the same amount of superphosphate and 1 cwt. nitrate of soda per acre, respectively. In 3 months the sheep pastured on the plats gained per head per week 1.9, 2.7, 2, 1.6, 1.7, and 1.7 lbs., respectively.

The yield and character of the hay grown on the different plats is discussed and experiments in Northamptonshire briefly mentioned.

Experiments on farming pasture at Waresley (*Dept. Agr. Cambridge Univ. Rpt. 1902, pp. 39-49*).—The effect of different manures on the yield of hay, as shown by the gains made by sheep pastured on sample plats, was studied, the experiment being a continuation of work previously reported on the value of different mixtures for seeding poor clay land formerly under tillage (E. S. R., 13, p. 638). In one case the land received no manure. In another no manure was added, but the sheep were fed 0.89 lb. per head daily of linseed cake. Two other plats were manured respectively with 10 cwt. of basic slag and 10 tons of manure per acre. The average gain per sheep per week on each of these 2 plats was 2.3 lbs. and on the remaining 2 plats 2.4 lbs.

The yield and character of the hay on the plats were also studied. According to the author "the yield of hay has been considerably influenced by the seeding, but neither the yield of hay nor the growth of the sheep has been affected by the manures."

Sheep-shearing test at Halle in 1901, C. Lehmann (*Arb. Deut. Landw. Gesell., 1902, No. 75, pp. 99, figs. 72*).—Detailed results are given of a sheep-shearing test. The average live weight of the 72 animals included was 57.2 kg. and that of the unwashed fleece 5.06 kg.

Maltese goats, J. H. Grout (*U. S. Consular Rpts., 71 (1903), No. 268, pp. 103, 104*).—The milch goats which furnish the greater part of the milk supply of Malta are described and brief notes given on the methods followed in the local goat industry.

Wheat compared with other grains for pigs, H. R. Smith (*Nebraska Sta. Bul. 75, pp. 33–36, fig. 1*).—Wheat was compared with other grains in a test made with 8 lots, each containing 4 Tamworths and Yorkshires, the so-called bacon type, and 2 Duroc-Jerseys and Berkshires, the so-called block type. Lot 1 was fed whole wheat dry, lot 2 whole wheat soaked 18 to 24 hours, lot 3 ground wheat, lot 4 ground wheat and corn, 1:1; lot 5 ground wheat and rye, 1:1; lot 6 ground wheat and shorts, 1:1; lot 7 ground corn, and lot 8 ground rye. The average weight of the pigs at the beginning of the trial was about 170 lbs. The average daily gain in the 8 lots was 0.63, 0.70, 0.76, 0.74, 0.70, 0.71, 0.71, and 0.67 lb., respectively, the feed eaten per pound of gain being 6.37, 5.75, 5.59, 5.86, 6.21, 6.12, 6.09, and 6.24 lbs., respectively. The pigs were sold at $5.525 per 100, the profits ranging from $3.60 with lot 7 to $7.81 with lot 2, the total profit for the 8 lots being $44.13. One of the pigs of each type fattened on corn and 1 of each type fattened on wheat were slaughtered at the station.

"Little difference was observed between carcasses of wheat-fed and carcasses of corn-fed hogs except that perhaps a little more lean meat was noticeable on the wheat hogs.

"The larger proportion of lean meat on the bacon hogs was very apparent."

The author's conclusions follow:

"Wheat can be profitably substituted for corn in feeding pigs so long as the price of wheat is not more than 9 per cent higher than corn. In feeding wheat to hogs it should first be soaked or ground. Of the two, soaking is more economical unless the grinding can be done for about 2 cts. per hundred pounds."

Corn *v.* wheat for pigs on alfalfa pasture, E. A. Burnett and H. R. Smith (*Nebraska Sta. Bul. 75, pp. 37, 38*).—The 18 cross-bred Tamworth and Duroc pigs, which had followed steers in a test noted above, were divided into 3 equal lots, lot 1 being fed corn, lot 2 corn with 5 per cent of dried blood added, and lot 3 wheat. In addition all the pigs were pastured on alfalfa and turned on rape once a week. At the beginning of the trial, which covered 6 weeks, the average weight of the pigs in the 3 lots was 146, 145, and 147 lbs., respectively, the average daily gain being 1.22, 1.3, and 1.3 lbs., respectively. The feed consumed per pound of gain was 4, 3.76, and 3.76 lbs., while the cost of the feed per pound of gain was 4, 4.04, and 4.13 cts., respectively. Not counting pasturage and labor the greatest profit, $3.88, was obtained with lot 2, and the smallest, $3.77, with lot 1. According to the author, "The addition of 5 per cent dried blood to corn makes a ration containing the same amount of digestible protein and the same nutritive ratio as the ration of wheat. It is significant that the gains on these 2 lots were the same."

Egg-laying competition conducted at the Hawkesbury Agricultural College, D. S. Thompson (*Agr. Gaz. New South Wales, 13 (1902), No. 2, pp. 1139–1145*).—Detailed statements are given of the number of eggs laid by different breeds and flocks.

Statistics of farm animals (*Twelfth Census of the United States, Census Rpts., vol. 5 (Agriculture, pt. 1), pp. CXLIII–CLXV, CLXXXVI–CCXXXII*).—Statistics, representing conditions on June 1, 1900, are given of the different farm animals kept in the United States, their value, distribution, and related topics. In addition, under each class, such subjects are discussed as the growth of the industry, markets and marketing, and in some cases feeds and feeding are also briefly spoken of.

Domestic animals.—The total number of farm animals on farms and ranges was 215,822,238, the total value being $2,981,722,945, of which sum the neat cattle constituted 49.5 per cent; horses, 30.1 per cent; mules, 6.6 per cent; asses and burros, 0.2 per cent; sheep, 5.7 per cent; swine, 7.8 per cent; and goats, 0.1 per cent. Of the value of neat cattle, over one-half is represented by the two classes of cows, those "kept for milk" and those kept for breeding and designated as "not kept for milk."

Neat cattle.—The total number of neat cattle was 69,438,758, of which 97.7 per cent were on farms and ranges and 2.3 per cent in barns and inclosures elsewhere. The estimated total value of neat cattle was $1,517,602,351. Of the 53,843,513 neat cattle 1 year old and over 28.7 per cent were steers, of which the great majority were raised for beef, only a few being work oxen.

Horses.—According to the estimates there were in the United States 18,390,441 work horses and 2,826,447 too young for work, making a grand total of 21,216,888 horses, of which 86.2 per cent were on farms and ranges and 13.8 per cent in barns and inclosures elsewhere. The total value of all the horses was $1,050,969,093.

Asses and burros.—On farms 95,603 asses and burros were kept and 15,847 elsewhere, the total value of all being $6,789,938.

Mules.—The total number of work mules 2 years old and over was 2,925,923, and the number of growing mules under 2 years was 519,106, making a grand total of 3,445,029 mules, of which 95 per cent were on farms and ranges.

Sheep and wool.—According to the reports received there were 61,837,112 sheep, of which 21,719,939 were lambs under 1 year, 32,058,920 ewes 1 year and over, and 8,058,253 rams and wethers 1 year and over. All but 0.4 per cent of this number were on farms and ranges. The total value of all the sheep on farms was $170,337,002, the lambs having an average value of $1.94, the ewes of $3.18, and the rams and wethers of $3.36, the general average for sheep of all ages being $2.76. The total number of fleeces shorn on farms and ranges was 44,092,948, having a total weight of 276,991,812 lbs. In addition it was estimated that the amount of wool from slaughtered sheep, i. e., pulled wool was 33,000,000 lbs., making the total amount of wool 309,991,812 lbs.

Goats and mohair.—The total number of goats reported was 1,949,605, all but 4 per cent being on farms and ranges. The total value of the goats on farms and ranges was $3,266,080. The total weight of the mohair fleeces produced in 1899 (the last figures given) was 961,328 lbs., the value being $267,864.

Swine.—The total number of swine reported was 64,694,222, of which 62,876,108, or 97.2 per cent, were on farms and ranges, and 1,818,114, or 2.8 per cent, were in barns and inclosures elsewhere, the total value of all the swine in the country being $238,736,548, which is equivalent to an average value of $3.69 each.

Income from sales of live stock.—Estimates are given of the number of farm animals sold for slaughter and other purposes, the aggregate value, including horses and mules, being estimated at approximately $1,000,000,000.

Poultry and eggs.—The total number of chickens, including guinea fowls, on farms and ranges was 233,598,085; the total number of turkeys, 6,599,367; geese, 5,676,863; and ducks, 4,807,358. According to the returns received poultry was kept on 88.8 per cent of the farms in the United States. The total value of the poultry raised on farms and ranges in 1899 was $136,891,877. "The production of eggs in 1899 was 1,293,819,186 dozens, an average of 5.5 dozens per chicken. No consideration was given to turkeys, geese, or ducks in calculating this average, as eggs from those fowls are used mainly for breeding purposes." The total value of the eggs was $144,286,158, or an average value of 11.2 cts. per dozen.

DAIRY FARMING—DAIRYING.

Feeding experiments with milch cows, 1900-1901, F. Friis (*53. Ber. Kgl. Vet. Landbohöjskoles Lab. Landökon. Forsög* [*Copenhagen*], *1902, pp. 30*).—This is a preliminary report on the results of the cooperative feeding experiments with milch cows conducted by the Copenhagen experiment station during the year 1900–1901. The plan of the experiments was similar to that of earlier work (E. S. R., 11, p. 780). The subject studied was the value of roots in comparison with grain. Four lots of 10 to 12 cows each were formed on 6 different dairy farms, and these were fed similar rations during a preparatory feeding period of 40 to 50 days. During the experimental period proper lot A received 7 lbs. grain (barley, rye, or oats, mixed) and 1½ lbs. cotton-seed meal; lot B, 4 lbs. grain and 4½ lbs. cotton-seed meal; lot C, 4 lbs. grain and 1½ lbs. cotton-seed meal; and lot D, 1 lb. grain and 4½ lbs. cotton-seed meal. In addition lots A and B were fed 4½ lbs. dry matter in mangel-wurzels and lots C and D 7½ lbs., all 4 lots receiving 6½ lbs. hay and 10 lbs. straw. The nutritive ratios of the rations fed to lots A and C were between 1:8 and 1:9, and those of the rations fed to lots B and D between 1:5 and 1:5.5.

The average daily yield of milk per head for the different lots was as follows: Lot A, 22.4 lbs.; lot B, 23.7 lbs.; lot C, 22.5 lbs.; and lot D, 24.2 lbs. The average percentage of fat in the milk produced by the different lots during the experimental period proper was as follows: Lot A, 3.11; lot B, 3.16; lot C, 3.11; and lot D, 3.10 per cent. The fat content of the milk was not therefore appreciably influenced by the character of the rations fed.

The results show that 3 lbs. of grain and 3 lbs. of dry matter in roots had very nearly the same feeding value under the conditions of the experiments. Lots B and D were fed richer rations than lots A and C. In either case, however, grain and dry matter in roots were found to possess a similar feeding value whether the nutritive ratio was 1:5 or 1:9.

In the comparison of oil meals and grain feed the results of a series of experiments with milch cows conducted during 1891–92 (E. S. R., 4, p. 601) showed that oil-cake meal (rape seed, palm nut, and sunflower-seed meal mixed in equal parts) possessed an appreciably higher feeding value than similar amounts of mixed grains. By methods of calculations it was found that the feeding value of 1 lb. of grain was equivalent in feeding value to ⅚ lb. of oil meals. In the same way the experiments of 1900–1901 furnished data showing that ¾ lb. of cotton-seed meal was equivalent to 1 lb. of grain. This ratio appeared to hold good whether a heavy or a light root feeding was practiced. Lots B and D therefore received ¾ lb. more cotton-seed meal than the equivalent of 3 lbs. of grain; hence the increased production of these lots.

The position of the experiment station on certain mooted questions in animal nutrition, particularly as to the value and applicability of the results of the cooperative Danish cow-feeding experiments to everyday conditions on the farm is explained and the practical value of the experiments maintained. The value of calculations of food equivalents, the use of data obtained by averaging the results for different farms, chemical analysis of feeding stuffs, and nutritive ratios are among the subjects discussed. It is argued that the feeding value of a fodder can not be established by means of chemical analysis with even approximate certainty. In practice, moreover, it is not possible to have chemical analyses made of the feeding stuffs employed, and the farmer must content himself by using figures for the average composition of feeding stuffs. Chemical analyses and nutritive ratios are looked upon as useful aids in controlling the composition of the feed rations rather than as means of determining their value. The relative valuation of food materials must be made by the farm animals themselves, and this finds expression in the figures of food equivalents, as suggested by Fjord. For conditions similar to those under which the experiments were conducted the figures obtained for the "replacement value" (the equivalent figures) of the feed stuffs experimented with are therefore believed to give important information and to be of greater value to the farmer than calculations from an assumed average composition of feeding stuffs and assumed nutritive ratios. The equivalent figures for the following feeds have been determined in the feeding experiments with milch cows conducted by the station: One pound mixed grain (barley, oats, or rye) = 1 lb. Indian corn = 1 lb. wheat bran = 1 lb. molasses feed = 1 lb. dry matter in roots = ¾ lb. cotton-seed meal. These figures are averages only. Corn, bran, and dry matter in roots may often be found to be somewhat more valuable than the small grains, pound for pound, so that their replacement value may lie between 0.95 and 1, and that of molasses feed may vary between 1 and 1.05.—F. W. WOLL.

Feeding experiments with gluten feed, N. RITLAND (*Norsk Landmandsblad, 21 (1902), No. 41, pp. 488–490*).—An experiment with 8 cows is reported, the result of which indicated that 1 lb. of gluten feed has a somewhat higher feeding value than ½ lb. rye bran and ½ lb. cotton-seed meal.—F. W. WOLL.

Feeding experiments with corn-molasses feed for milch cows (*Ber. Norges Landbr. Hoiskoles Virks., 1901–2, pp. 190–192*).

The Hegelund method of milking, C. W. AARHUS (*Den Hegelundske Malkemetode. Denmark, 1902, pp. 49, ill.*).—This is a popular treatise on the subject of milking, particularly on the Hegelund method (E. S. R., 14, p. 286). The various manipulations are illustrated. The gain in production obtained by the use of this method is shown by a number of cases. The author states that by the adoption of the Hegelund method the product of the dairy may on the average be increased 12 per cent, partly through the production of more and richer milk, and partly through the resulting improvement in the dairy qualities of the cows. The effect of a careful and exhaustive system of milking on the dairy herd and in preventing diseases of the udder is discussed at some length.—F. W. WOLL.

Milking according to Dr. Hegelund's method, L. STEEN (*Christiania, 1902, pp. 18; Tidsskr. Norske Landbr., 1902, No. 9, sup.*).—A popular discussion published by the Royal Society for Norway's Weal.—F. W. WOLL.

On milking, with special reference to clean milking, K. W. AADERMAN (*Landtmannen, 13 (1902), No. 42, pp. 668–676*).

Dairy herd record and creamery notes, R. W. CLARK (*Alabama College Sta. Bul. 121, pp. 183–203*).—A summary is given of the record of the station herd of about 8 cows for 2 years. The average annual production per cow was 3,954.6 lbs. of milk and 226 lbs. of butter. The cost of keeping was $24.07, and the average cost of producing milk 5.5 cts. per gallon, and butter 11 cts. per pound. Data are given on the cost of raising 6 heifer calves. The average cost the first year was $11.77, and the average cost to the time of calving was $19.47. Methods suggested for the removal of the odor and taste of bitterweed and wild onion from milk and cream were tested. The compound in bitterweed responsible for the bad flavor was thought to be held largely or entirely by the milk serum and that in wild onion by the fat. The bitterweed taste was entirely removed from cream by washing. This was done by mixing the cream with 2 or more parts of water, at temperatures of 70° F. or above, and running the mixture through the separator. The other methods tested, such as feeding cows cooking soda and the addition of saltpeter to the cream, were unsatisfactory. In comparative tests of different systems of creaming the separator left on an average 0.03 per cent of fat in the skim milk, deep setting 1.3, and shallow pans 0.6 per cent, the temperatures being from 81 to 85° F.

In an experiment lasting 4 weeks 3 cows were fed a ration consisting of 9 lbs. of cotton seed, 3 lbs. of bran, and 10 lbs. of sorghum hay, and 3 were fed a ration consisting of 5¼ lbs. of cotton-seed meal, 3 lbs. of bran, and 10 lbs. of cotton-seed hulls. There was practically no difference in the melting point and content of volatile fatty acids of the butter made from the 2 rations. During 2 months 9 cows on pasture were fed different combinations of cotton seed, cotton-seed meal, and bran. Feeding cotton seed and cotton-seed meal, as compared with bran alone, apparently increased the melting point of the butter 1 to 3° C. The content of volatile fatty acids was not materially affected by the different rations. Tests were made of potassium bichromate, mercuric chlorid, and formalin for preserving composite milk samples. The author considers that the best results were obtained with formalin, ½ teaspoonful being added to 1 pint of milk. Cream containing 0.25 per cent of acid and churned at a temperature of 63° F. gave a more exhaustive churning than cream containing 0.37 per cent of acid and churned at a temperature of 70°. Cream containing over 50 per cent of fat or less than 25 per cent did not churn well. The best results were obtained with cream containing 33 per cent of fat. In churning experiments with whole milk a 12-gal. barrel churn was compared with a 3-gal. dash churn. The results of 5 trials showed little difference in the 2 methods.

The dairy herd, G. H. True (*Arizona Sta. Rpt. 1902, pp. 256–258*).—A monthly record is given for 6 cows for 1 year, with notes on the care and management of the herd. The yield of milk ranged from 3,931.5 lbs. to 7,319.7 lbs., and the yield of fat from 210.42 lbs. to 377.47 lbs. The record is compared with that of the previous year.

Feeding hay to cows on pasture, G. H. True (*Arizona Sta. Rpt. 1902, pp. 258, 259*).—The experiment included 2 lots of 3 cows each and lasted from September 16 to January 6. From November 12 to January 6 one lot was fed 2,125 lbs. of mixed barley and alfalfa hay. The yield of butter fat from the cows pastured during the whole experiment was 16.5 lbs. less during the last 2 months than during the first 2 months of the experiment, while the cows fed hay showed a decrease of only 11.06 lbs. The difference in yield was not sufficient to pay for the hay fed. "The results of this trial should not be taken for more than they are worth, and on the strength of it the writer would not argue against the feeding of hay to cows on pasture during the colder months."

Report of the Milk Control Station in Christiania, Norway, 1901, H. Olsen (*Aarsber. Offent. Foranstalt. Landbr. Fremme, 1901, pp. 311–313*).—During the year 44,817 samples of dairy products were tested. The average fat content of the 40,049 samples of milk was 3.46 per cent. The average fat content of the 4,409 samples of cream was 17.67 per cent.—F. W. WOLL.

Report of the Milk Control Station, Trondhjem, Norway, 1901, T. Solberg (*Aarsber. Offent. Foranstalt. Landbr. Fremme, 1901, pp. 316–319*).—During the year 53,436 samples were examined. The average fat content of 53,283 samples of milk was 3.52 per cent. Attention is called to the usual rise in the fat content of the milk when the cows are let out in the spring, from 3.36 per cent in May to 3.54 per cent in June.—F. W. WOLL.

Report of the Milk Control Station, Bergen, Norway, 1901, K. Seielstad (*Aarsber. Offent. Foranstalt. Landbr. Fremme, 1901, pp. 319–323*).—Similar data are given as indicated under the reports of the similar stations in Christiania and Trondhjem.—F. W. WOLL.

The cause of ropy and slimy milk, J. Tillmans, J. König, and A. Spieckermann (*Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), Nos. 19, pp. 897–913; 20, pp. 945–961*).—The literature of this subject is reviewed and several investigations are reported. The behavior of several species of bacteria in sterilized and unsterilized milk was studied. The results showed marked differences in the earliness with which ropiness appeared and in its duration and intensity in sterilized milk inoculated with different species. The disappearance of ropiness in some cases was coincident with the appearance of a gassy fermentation. In unsterilized milk, with which similar results were obtained, the bacteria causing ropiness restrained the development of the lactic-acid bacteria. A study was made of the chemical changes taking place in milk inoculated with such bacteria. The solids were diminished largely through the decomposition of the sugar. The acidity was increased. The fat in some cases was acted upon and the casein was peptonized to some extent. Definite conclusions were not reached in investigations concerning the formation and chemical nature of the viscous material.

Contribution to the study of the cause of slimy and ropy milk, T. GRUBER (*Rev. Gén. Lait, 2* (*1902*), *No. 5, pp. 97–100*).—The author notes that 16 micro-organisms—10 bacilli and 6 micrococci—causing viscous and ropy milk have been isolated. The biological characteristics of a micrococcus isolated by the author from milk and designated *Coccus lactis viscoci* are reported. The organism when inoculated into milk rapidly produced ropiness and coagulated and peptonized the casein.

Milk powder, M. EKENBERG (*K. Landt. Akad. Handl. Tidskr., 41* (*1902*), *No. 1, pp. 88–92*).—By evaporation of whole or skim milk in vacuo at a low temperature (below the point of coagulation of albumin), the author succeeded in preparing a fine white powder which will dissolve to a milk-like solution with water of a temperature of 60 to 70° C. The powder has the flavor of milk, and its solution in water resembles milk perfectly in appearance, flavor, and taste, and in the fact that the casein in this solution is precipitated by rennet. The keeping qualities of the milk powder are stated to be good. It does not mold, ferment, turn acid or rancid, and is not hygroscopic. According to the figures given the expense of the manufacture of the powder is slightly over one-third of a cent per liter of milk. One kilogram of the powder will make about 10 liters of milk of the original concentration. The apparatus for the manufacture of the powder is simple, so that it can easily be attended to by the ordinary help in creameries. It can also be used for the evaporation of whey. Important results are anticipated from the utilization of skim milk for the manufacture of this powder, which can be used as a human food, in bread making, for puddings, and numerous other household purposes. Considerable advantage is claimed for the powder over protein foods manufactured from milk, like protene, proton, etc., both on account of lower cost of manufacture, and because the albuminoids of the milk are present in the powder in the right physiological condition for use as a food material.—F. W. WOLL.

The refractometer testing of butter and a new form of thermometer for the butter refractometer, E. BAIER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 5* (*1902*), *No. 23, pp. 1145–1150, fig. 1*).—Determinations of the refractometer number of 10,487 samples of butter during a period of 6 years are summarized. Of the samples of butter examined from November to May, 2 per cent showed a refractometer number at 35° C. of 43, 26 per cent 44, 57 per cent 45, 11 per cent 46, and 4 per cent 47; and of the samples examined from June to October, 6 per cent showed a refractometer number of 45, 27 per cent 46, 43 per cent 47, and 23 per cent 48. The variation was less in the winter butter. Instead of an average number of 47 at 35° C., the author believes that standards of 45.7 for butter from November to May, and 47.7 for butter from June to October would be better.

Denmark's butter exports, 1901-2, B. BÖGGILD (*Tidsskr. Landökon., 21* (*1902*), *No. 12, pp. 593–602*).—The total imports of butter during the year ended October 30, 1902, were 49,217,101 Danish pounds (1.1 lbs avoirdupois), and the exports 175,510,907 lbs., leaving a net exportation of 126,300,000 lbs., an increase over that of the preceding year of about 7,400,000 lbs. Of the exports 168,300,000 lbs. were sent to Great Britain, or over 10,000,000 lbs. more than during the year 1900–1901. The average quotation for high-grade butter for the year was 95.1 öre per pound (equivalent to 23.4 cts. per pound avoirdupois).—F. W. WOLL.

Swedish butter exhibits (*Landtmannen, 13* (*1902*), *No. 50, pp. 798–803*).

Danish cooperative creameries during the past twenty years, B. BÖGGILD (*Tidsskr. Landökon., 21* (*1902*), *No. 4, pp. 249–291*).—A sketch of the development and present condition of the Danish cooperative creameries.—F. W. WOLL.

Trials with different systems of illumination for creameries, P. V. F. PETERSEN and K. S. KRISTENSEN (*54. Ber. Kgl. Vet. Landbohojskoles Lab. Landokon. Forsog* [*Copenhagen*], *1902, pp. 94*).—In a comparative study of electric and acetylene light for use in creameries, the authors find that considering first cost and the cost of maintenance there is but little difference in expense between the 2 systems. The cost of either of the systems of illumination will be found considerably higher than kerosene lamps, but more and better light is obtained. Discussing the objections raised against acetylene light, it is stated that the danger of explosion with a well-built apparatus which is not handled recklessly is small, and that the odor of acetylene gas does not come into consideration when the generator is properly constructed and the piping well done. Acetylene light had been used in Hedelykke creamery (Denmark) for a year and a half at the writing of this report, during which time no criticism of the butter had been made on the part of the commission men or judges, which were traceable to the system of illumination used.—F. W. WOLL.

Some of the compounds present in American Cheddar cheese, L. L. VAN SLYKE and E. B. HART (*New York State Sta. Bul. 219, pp. 203–216*).—Introductory notes are given on the different compounds formed in cheese during the process of ripening, and experimental work covering a number of years is reported. Paranuclein or pseudonuclein was found in all the cheeses examined. Preparations were obtained by extraction with water and precipitation with 0.2 per cent hydrochloric acid. Methods of purification further employed were not satisfactory in removing all the impurities. Elementary analyses are also given of preparations of lysatin, histidin, lysin, and putrescin (tetramethylenediamin), and the methods employed in the separation of these compounds are described. In cheese 4½ months old the authors found 3 basic products, lysatin, histidin, and lysin, and in cheese 15 months old putrescin and lysin were found. A high content of ammonia is noted as a marked characteristic of cheese ripened at temperatures above 16 to 18° C., and a usual accompaniment of a pungent flavor. The presence of free hydrogen in gassy cheese is considered easily capable of favoring the early formation of the reduction products putrescin, cadaverin, and ammonia.

"There appears to be good evidence that there is regularly in the cheese-ripening process, in the case of hard cheeses like Emmenthaler and American Cheddar, a conversion of primary into secondary amido compounds, and these chemical changes may explain, perhaps, the gradual development of flavor in normal cheese; in other words, we may find that the changing flavor of cheese, as it ages, is due, to some extent, to increasing quantities of secondary amido compounds. . . .

The subject of cheese flavors is one of complex difficulties, but it is safe to say that these flavors are due to the presence of specific compounds, and any work that shows in cheese the formation and presence of compounds capable of imparting flavors will contribute to the solution of a problem whose details are now little understood."

Statistics of dairy cows and the dairy industry (*Twelfth Census United States, Census Rpts., vol. 5* (*Agriculture, pt. 1*), *pp. CLXV–CLXXXVI*).—The early history of dairying in the United States is briefly reviewed, and statistics are given showing the condition of the dairy industry on June 1, 1900. The total number of dairy cows on that date was 18,112,707, valued at $537,232,246. Of this number 17,139,674 cows were on farms and ranges, and valued at $29.68 each. The milk produced on farms and ranges in 1899 was reported as 7,266,392,674 gal., and that not produced on farms and ranges was estimated as 462,190,676 gal., making a total production of 7,728,583,350 gal. The total production of butter was 1,574,471,673 lbs., cheese 298,344,654 lbs., and condensed milk 186,921,787 lbs. The 10 most important States as regards the number of cows were in order of rank New York, Iowa, Illinois, Wisconsin, Pennsylvania, Texas, Ohio, Missouri, Minnesota, and Kansas. As regards the number of gallons of milk produced in 1899 the rank was as follows: New York, Iowa, Pennsylvania, Wisconsin, Illinois, Ohio, Michigan, Minnesota, Missouri, and Texas. With respect to the farm value of dairy produce the order was: New York, Pennsylvania, Illinois, Iowa, Wisconsin, Ohio, Michigan, Minnesota, Texas, and Missouri. With respect to the number of farms which derived their principal income from dairy produce the order was: New York, Pennsylvania, Wisconsin, Maine, Vermont, Illinois, Massachusetts, Michigan, Ohio, and Arkansas. "From every point of view New York ranked as the leading dairy State." It is considered as proved that butter and cheese can be made with profit in most parts of North America. "Generally speaking, good butter can be made wherever good beef can be raised."

VETERINARY SCIENCE AND PRACTICE.

Studies on the phenomenon of agglutination, C. NICOLLE and M. TRENEL (*Ann. Inst. Pasteur, 16* (*1902*), *No. 8, pp. 562–586*).—A critical review of the extensive literature of this subject is presented. The species of bacteria most studied with regard to the phenomenon of agglutination are typhoid and tubercle bacilli. The authors found as a result of their extensive experiments that the susceptibility to agglutination and the power of agglutinating are apparently properties which are inherent in all free cells, especially bacteria. Such differences in these properties, however, are to be observed that bacteria may for practical purposes be divided into species which are agglutinable and agglutinogenic, and those which are nonagglutinable and nonagglutinogenic. Both these properties appear to exist together in about the same relative proportions in different species of bacteria. The motile bacteria are much more susceptible to agglutination than nonmotile forms, and it appears probable that motility is almost necessary to the existence of pronounced power of agglutination. Another important conclusion mentioned by the authors is that the agglutinating power appears to be associated with the presence of a membrane upon the bacteria. The more marked the membrane of a given species of bacteria the more pronounced is the susceptibility to agglutination and the power of causing agglutination.

The dissociation of the agglutinating and sensibilizing properties of specific sera, A. DUBOIS (*Ann. Inst. Pasteur, 16* (*1902*), *No. 9, pp. 690–693*).—The author conducted experiments with the blood of the common fowl. The blood when defibrinated and subjected to a temperature of 115° C. forms a mass which can not be injected. If, however, the red corpuscles are previously washed with normal salt solution for the purpose of removing other elements of the serum, the emulsion may then be heated in steam to a temperature of 115° for a quarter of an hour, with the result that a somewhat cloudy liquid is obtained, but one which can be used in making injections. During the author's experiments it was found that the serum of rabbits treated with red corpuscles from fowls after heating to a temperature of 115° C. did not contain the sensibilizing substance, but that the agglutinins were present in considerable number. It is believed, therefore, that these substances are distinct and that one may exist without the presence of the other.

The effect of absorption upon the action of alexin, M. WILDE (*Arch. Hyg., 44* (*1902*), *No. 1, pp. 1–74*).—This paper contains an account of experiments instituted for the purpose of determining the extent to which alexins are absorbed by various substances, and the effect of this absorption upon the bactericide action of serum. The literature of the subject is carefully reviewed in connection with a bibliography. The experiments conducted by the author included a test of the extent of absorption of alexin by dead bacteria, living bacteria, organic cells, and insoluble proteids. The serum for use in these experiments came from various species of animals, including cattle, dogs, and rabbits. The bacterial organisms which were employed were chiefly cholera vibrio and anthrax bacilli. During these experiments it was found that various substances, especially living and dead bacteria, yeast cells, red blood corpuscles, disintegrated tissue cells, and insoluble proteids, particularly aleuronat, may entirely destroy the bactericide and hemolytic action of alexin from the serum of cattle, dogs, and rabbits. The disappearance of the active properties of these sera occurs as a consequence of the combination of the alexin with the other bodies mentioned and is in the nature of a chemical rather than a purely physical absorption. The absorption of the alexins does not depend entirely upon the quantity of the substances and the time of exposure, but also upon the temperature at which the mixtures are maintained. At a temperature of 0° C. no absorption of the alexin took place. No regeneration of alexin occurs after it has once become fixed. The absorptive power of the various substances already mentioned is not removed by heating to the boiling temperature. The experiments of the author give no support to the assumption of a plurality of alexins in the serum of one species of animal. The alexin may also be fixed inside of the animal body so that guinea pigs are destroyed by an intraperitoneal injection of a nonfatal dose of cholera or typhoid bacilli if a certain quantity of absorbing material is injected at the same time.

The rôle of the membrane of bacteria in agglutination, W. Defalle (*Ann. Inst. Pasteur, 16 (1902), No. 8, pp. 595–613*).—In the author's experiments a large number of the more common species of bacilli were employed. As a result of the experiments and observations made by the author it is concluded that the antibodies as well as the agglutinins, and to a certain extent the sensibilizing substances appear to be products formed in the organism as a result of resorption of the bacterial membranes. The author found that, other things being equal, the better developed the membrane around a given species of bacteria the richer it was in substance capable of producing an organic reaction and the more abundant was the production of antibodies. The bacterial organism was also more susceptible to these substances than bacteria in which the membrane was less well developed.

Variations in the effects and nature of the secretions of a pathogenic organism, Charrin and Guillemonat (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 21, pp. 1240–1242*).—Attention is called to the fact that inoculations with the soluble products of different pathogenic organisms vary extremely in the rapidity and intensity of their action. In the case of some organisms the effect is shown only after a period of considerable length, while with *Bacillus pyocyaneus* injurious effects may be produced within a few minutes or almost instantaneously. A study of the secretions of this organism shows that death may be produced by inoculation of its soluble products without any intervening period of incubation. The toxicity of these products is shown not to be due to the coloring matter, since the latter is even less toxic than certain organic coloring matters, such as bilirubin.

The differentiation of anaerobic bacilli, P. Achalme (*Ann. Inst. Pasteur, 16 (1902), No. 9, pp. 641–662*).—A variety of bacterial organisms were studied, including the bacillus of tetanus, blackleg, botulism, as well as *B. enteritidis sporogenes*. The author concludes from his studies that the morphology of bacteria can not be used as a basis for differentiating the species. The motility of bacterial organisms is also of little diagnostic value. A large number of bacteria are motile at times, and those which are most actively motile are sometimes comparatively motionless. The reaction of bacteria to stains is of more value in diagnosis. Similar statements are made for the aspect of colonies of bacteria on solid media, sporulation, and especially for the assimilative functions of bacteria. The growth, absorption of material, and excretion of bacteria on various nutrient media form, according to the author, the most important criteria for differentiating species.

The physiology of spore formation in bacilli, and notes on the growth of certain anaerobic bacteria, T. Matzuschita (*Arch. Hyg., 43 (1902), No. 3–4, pp. 267–376, pls. 2*).—An elaborate review of the literature of this subject is presented and detailed notes are given on the various methods which have thus far been employed for producing anaerobic conditions for the development of bacteria. The author's experiments involved tests of all the original methods, and the organisms experimented with include the bacillus of malignant edema, blackleg, anthrax, *Bacillus botulinus, B. sporogenes, B. subtilis,* and *Clostridium butyricum.*

In these experiments it was found that anaerobic bacteria developed abundantly on slant agar preparations and on the surface of plate cultures in the presence of hydrogen or any space which is free from oxygen. In the presence of oxygen anaerobic bacteria develop in mixed cultures with aerobic bacteria, but are not able to develop in the presence of dead aerobic bacteria or any filtrate from a bouillon culture of aerobic organisms. The maximum quantity of oxygen in which the growth of obligate anaerobic bacteria takes place is about 0.0031 per cent, and the minimum air pressure suitable for the growth of obligate aerobic forms appears to be exceedingly low. Bacterial organisms multiply rapidly in nutrient media. The media then becomes impoverished and finally spore formation occurs. Continued active growth under favorable conditions never brings about the formation of spores. The primary cause of spore formation is lack of nutritive material. In addition to this lack of nutritive material, oxygen plays an important part in the spore formation in bacteria. Facultative and obligate anaerobic bacteria produce spores rapidly in the presence of oxygen. The spore formation of anaerobic bacteria after the admission of air takes place rapidly under otherwise favorable conditions, even when an abundance of nutritive material is still present. Aerobic bacteria never produce spores in an atmosphere of hydrogen and under an air pressure of less than 30 mm. The formation of spores takes place most rapidly in nutrient media which are unfavorable to the growth of the bacteria in question. The optimum amount of common salt for spore formation in anaerobic bacteria is about 0.25 to 0.5 per cent, and of grape sugar 5 to 10 per cent, while the optimum temperature varies from 34 to 38° C. During the author's experiments it was found that anaerobic bacteria possess a much lower resisting power against acids than against alkalis. The formation of spores takes place more readily in a dark room than in diffuse sunlight.

Differential diagnosis of various micro-organisms belonging to the group of hemorrhagic septicemia with the help of specific serum reactions, O. Voges (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 13, Orig., pp. 645–650*).—The diseases belonging to the general group of hemorrhagic septicemia are classified by the author into 4 sections, viz., Schweinepest, hog cholera, swine plague, fowl cholera, and rabbet septicemia. It is maintained by the author that the serum reaction is normally specific for each of these diseases. It was found that no serum could be obtained which was specific for hog cholera and swine plague at the same time.

Unknown infection material, E. Joest (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), Nos. 8, Orig., pp. 361–384; 9, pp. 410–422*).—The author reviews the literature of the subject in a critical manner, in connection with an extensive bibliography. Especial attention is given to a discussion of those diseases of which the nature of the virus is not understood. These include smallpox, foot-and-mouth disease, rinderpest, rabies, mosaic disease of tobacco, etc. A classification of infectious material is adopted in which different kinds of virus are arranged as follows: Living infectious material, including micro-organisms which may in turn be morphologically demonstrable and may be cultivated; these include bacteria, protozoa, and other vegetable and animal microparasites. This general group of micro-organisms also includes those which are not known morphologically and can not be cultivated; this subgroup includes micro-organisms which can be seen by the aid of the microscope, but have not yet been identified definitely as a cause of disease, and also micro-organisms which are so minute as to be beyond the limits of visibility under the microscope. Besides micro-organisms, the group of living infectious material includes the so-called living, fluid contagium. Chemical infectious materials are considered by the author under the head of intoxication material. It is argued that a strictly infection material and intoxication material are fundamentally different substances and that no mere toxin is capable of producing disease which can be communicated from one animal or plant to another.

Experiments in the infection of animals by means of cutaneous inoculation, E. Fritsche (*Arb. K. Gesundheitsamte, 18 (1902), No. 3, pp. 453-474*). A critical review of the literature of this subject is presented by the author. The experiments reported in this paper were made on guinea pigs, rabbits, and mice, and the organisms used in the experiments included those of anthrax, diphtheria, plague, swine erysipelas, swine plague, fowl cholera, glanders, human and bovine tuberculosis, as well as *Streptococcus pyogenes, Diplococcus lanceolatus,* and *Staphylococcus pyogenes aureus.* In all the experiments a portion of the skin of the abdomen of the experimental animals was shaved so as to remove the hair and a part of outer layers of the cuticle. Care was taken not to scrape the skin to such an extent as to cause bleeding. The cultures of the pathogenic bacteria were then rubbed on the shaved areas. The general results of these experiments may be stated as follows:

All of the organisms with which experiments were made were found to be capable of infecting the experimental animals through the skin when treated in the manner just mentioned, and causing death. The course of the disease was in general longer in cutaneous than in subcutaneous inoculation. In the case of tuberculosis the course of the disease was twice as long in the first-mentioned as in the second-mentioned method of inoculation. The course traveled by the bacteria in gaining entrance to the experimental animals varied considerably. The bacilli of anthrax and swine erysipelas penetrated through the hair follicles. Some of the species of pathogenic bacteria, such as the diphtheria bacilli, did not penetrate very deeply into the skin. The organisms of plague and glanders, as well as the Streptococcus, gained entrance by means of the lymphatic vessels, while the organisms of swine plague and hog cholera, as well as *Diplococcus lanceolatus*, entered the experimental animals through the capillaries and the blood vessels.

A bibliography of the subject is appended to the article.

The acid-proof and alcohol-proof properties of Streptothrix farcinica, and the relationship of species of Streptothrix to the acid-proof fungi, C. Feistmantel (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 10, Orig., pp. 433-445*).—In the study of *S. farcinica* on material obtained from diseased cattle, the author observed that the filaments of these organs in streaked cultures were proof against acids and alcohol, whether the original material came from pus, pure cultures on various nutrient media, or from sections of pathological material. The organisms were readily stained by the Gram method and retained some of the stain even after a long decoloration in alcohol. The formation of tubercles was observed in the lungs of guinea pigs which were inoculated by the intravenous method, within about 3 weeks after inoculation. The author discusses the behavior of this organism upon various nutrient media, in connection with a review of the literature of the subject. A bibliography of 19 titles is added to the article.

Accidents following upon vaccination, their pathogeny and prophylaxis, E. Leclainche and H. Vallee (*Ann. Inst. Pasteur, 16 (1902), No. 8, pp. 614-624*).—The authors briefly review the history of cases in which infection has taken place as a result of vaccination against diseases, such as anthrax, blackleg, and swine erysipelas. It is argued that the process for manufacturing vaccines has been so perfected that these substances can hardly be considered dangerous or as responsible for infection in the cases which have been recorded. The greatest danger appears to lie in the careless use of virus in connection with these vaccines for the purpose of increasing the resisting power of the animal and the consequent immunity.

Report of the stock and brands branch for the year 1901, A. Salwey, R. D. Jones, and J. D. Stewart (*New South Wales, Dept. Mines and Agr., Stock and Brands Branch Rpt. 1901, pp. 29*).—In this report notes are given on the inspection work, number of horses, cattle, sheep, pigs, and dogs, and on the most prevalent diseases in New South Wales during the year covered by the report. The chief diseases of horses were ophthalmia, influenza, and Australian stringhalt. The most important diseases of cattle were pleuro-pneumonia, blackleg, actinomycosis, tuberculosis, and Texas fever. The chief diseases observed in sheep were scab, anthrax, foot rot, fluke worms, and lung and stomach worms. The best results in the treatment of lung and stomach worms were obtained from the use of arsenic and acid drench and turpentine. A special station has been established, in which many cattle are maintained for the purpose of furnishing blood for inoculating cattle which are susceptible to Texas fever.

Annual report of the imperial bacteriologist for the year 1901-2, A. Lingard (*Calcutta: Supt. Govt. Printing, India, 1902, pp. 15*).—During the year covered by this report 50,000 doses of anti-rinderpest serum were prepared by a veterinarian. The serum was prepared by both the slow and rapid methods. By the latter method the serum may be ready for use in 21 days, while by the slow method 80 days are required. It is recommended that cattle under 3 years of age should not be utilized in the preparation of serum, since they yield a serum of much lower protective power than older animals. Detailed notes are given on the results obtained from the use of this serum in different parts of India. Experiments with this serum in protection of buffaloes showed that 5 cc. of the serum per 600 lbs. live weight was sufficient to render the animals immune.

Notes are also given on the prevalence of anthrax in India. In the preparation of protective anthrax serum the author's experiments showed that the inoculation disease runs a course of from 70 to 144 hours in plains cattle and one of from 35 to 120 hours in hill cattle. The hill cattle are much more susceptible to anthrax than those of the plains. Brief descriptive notes are also given on the occurrence of epizootic lymphangitis, surra, strangles, paralysis, and influenza.

Annual report of the veterinary service for the year 1901 (*Jour. Khediv. Agr. Soc. and School Agr., 4* (*1902*), *No. 3, pp. 112-116*).—Brief notes are given on the occurrence of foot-and-mouth disease, anthrax, sheep pox, rabies, glanders, contagious pleuro-pneumonia, barbone, and cattle plague. It is said that barbone is a rapidly fatal disease which occurs chiefly during the low and rising period of the Nile; most cases have apparently been traced to animals drinking water from stagnant pools.

A discussion of the relationship of human and bovine tuberculosis, J. D. Hamilton et al. (*British Med. Jour., 1902, No. 2178, pp. 944-948*).—A critical review is given of the experimental facts upon which Koch based his conclusions, in which the identity of human and bovine tuberculosis was denied. It is argued that in some of Koch's experiments where the issue was considered doubtful other investigators might have considered the cases as positive infections with tuberculosis. Attention is called to the great variation in the virulence of tubercle bacilli under different conditions. The authors propose the following criterion for determining whether or not an infection has taken place: If it is found that inoculated virus has died at the point of inoculation and failed to produce tubercles in other parts of the body, the result must be considered negative. If the bacillus is found only in the local lesion at the point of inoculation and has increased some in numbers the case may be considered doubtful. If, however, the bacillus is found in the local lesion in a cheesy abscess and if the adjacent lymphatic glands show a tuberculous structure, the case must be considered as proving the fact of infection.

The question of the identity of human and bovine tuberculosis, A. von Székely (*Centbl. Bakt. u. Par., 1. Abt., 32* (*1902*), *Nos. 6, Ref., pp 167-173; 7, pp. 193-203; 8, pp. 225-237*).—The author presents a review of the literature bearing on this subject which has been published since Koch's address before the congress on tuberculosis in London. The experiments and conclusions of Koch are outlined and explained in detail and especial attention is given, in a review of the literature of the subject since Koch's address, to classification of the various articles with reference to their bearing on this question. The literature of German, French, English, American, and Italian authors is reviewed with considerable detail and with apparent fairness. At the conclusion of the author's special criticism of these various articles it is stated that the main question at issue regarding the identity of tuberculosis in man and cattle is still unsettled.

The British Congress on Tuberculosis, G. T. Brown (*Jour. Bath and West and Southern Counties Soc. [England], 4. ser., 12 (1902), pp. 41–52*).—A brief review of the more important papers which were read at this congress. The author expresses the belief that tuberculosis may be effectively combated in both man and animals.

On tuberculosis in cattle with special reference to the virulence of the milk of tuberculous cows, E. J. McWeeney (*Jour. Dept. Agr. and Tech. Instr., Ireland, 2 (1902), No. 4, pp. 662–675*).—The author reviews the question of the infectiousness of the milk of tuberculous cows in connection with a bibliography of 34 titles. In his opinion it is desirable that tuberculous cows be divided, for purposes of experimentation and discussion, into 3 classes: Those which show clinical symptoms of tuberculosis, those which are affected with tuberculosis of the udder, and those which react to tuberculin but show no clinical symptoms of the disease. The author's experiments were made with 5 cows of the third class. It is believed that more than half of all the cows of Germany and Great Britain belong to this class. The udders of the 5 cows were carefully cleaned before milking, and after the milk was collected it was passed through a centrifuge; the sediment collected at the bottom was then used for inoculating guinea pigs, a quantity of the cream being inoculated into the opposite side of each experimental animal at the same time. The total number of experiments thus performed was 23, and no case of tuberculosis developed in the experimental animals. Seven other animals were inoculated with mixed milk from tuberculous animals, with the same result. The results of these experiments are in accord with those of Ostertag, who was likewise unable to find tubercle bacilli in the milk of cows which merely reacted to tuberculin but which did not give evidence of clinical symptoms. The method of combating tuberculosis recommended by the author is the system devised by Bang.

The nature of the tuberculin reaction, K. Preisich and P. Heim (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 14, Orig., pp. 712–734*).—The recent literature relative to tuberculin tests is reviewed in connection with a bibliography of the subject. Experiments were instituted for the purpose of obtaining evidence on the question whether the tuberculin reaction absolutely required the presence of tuberculosis in the experimental animals, and whether the presence of products of the tubercle bacillus was necessary in order to obtain a reaction to tuberculin or whether other substances formed under the influence of the tubercle bacillus could give rise to a reaction to tuberculin.

The first experiments were with guinea pigs, but it was found that the body temperature in these animals varied too greatly. Rabbits were found to maintain a more constant temperature in health and were therefore chosen as more suitable for the purposes of these experiments. One series of experiments was conducted during which collodion sacs containing cultures of tubercle bacilli were placed in the peritoneal cavity of healthy rabbits. This operation was found to be a difficult one, since the collodion sacs were frequently ruptured and the animals thus became infected with tuberculosis. In the few cases in which the operations were successful and typical reaction to tuberculin occurred without the presence of an infection of tuberculosis in experimental animals, this reaction is explained as being due to some substance produced by the growth of the tubercle bacilli in the collodion sacs and subsequently distributed in the experimental animals by diffusion through the collodion sacs.

Another long series of experiments was undertaken on rabbits during which the action of tuberculin in connection with other materials was tested. The materials used along with the tuberculin included tuberculous glands, spleen, liver, and other organs, blood serum of tuberculous and healthy guinea pigs and children, and similar tuberculous and nontuberculous material preserved in salt solution. As a result of these experiments, it was found that the pure blood serum of healthy guinea pigs together with tuberculin caused an elevation of temperature in healthy rabbits in a large percentage of cases. When the blood serum was preserved in salt solution, the elevation of temperature was more constant and more pronounced. The blood serum of healthy children, together with tuberculin, caused an elevation of temperature only when it was preserved in salt solution. Pure blood serum of tuberculous guinea pigs, together with tuberculin, when injected into healthy rabbits invariably caused a rise of temperature, while the pure blood serum of tuberculous children, together with tuberculin, caused a rise of temperature in a number of cases, and this elevation of temperature was more pronounced when the material was preserved in salt solution.

The authors draw the following conclusions from these experiments: Tuberculin is a reliable diagnostic agent for tuberculosis, but its value in differential diagnosis is much less. Reaction to tuberculin may be obtained in consequence of the presence of other pathological processes than tuberculosis, and this appears to be especially true for man. In veterinary practice tuberculin is considered a valuable reagent in cases where it is necessary to determine whether an apparently healthy animal is tuberculous or not. It appears to be desirable, however, in making tuberculin tests to observe carefully the symptoms of the animal before injecting the tuberculin and to have a record of variations in temperature for a number of days previous to the inoculation.

Concerning bacilli which resemble those of tuberculosis and the bacilli of smegma, A. Weber (*Arb. K. Gesundheitsamte, 19 (1902), No. 2, pp. 251–283, pls. 5*).—A review of the literature of this subject is presented in connection with an extensive bibliography from 1882 to 1902. The organisms belonging to the class of acid-fast bacteria are divided by the author into 3 groups: The first group contains the nearest relatives of the human tubercle bacillus (viz, the bacilli of bovine and avian tuberculosis and bacilli found in fish and other cold-blooded animals); the second group contains bacilli of a saprophytic nature, which have received various names according to the material in which they are found; the third group includes smegma bacilli. The author confined his attention during the experiments reported in this paper to the second and third groups. The subject matter of the author's report on the second group includes a discussion of the origin, distribution, differentiation, diagnosis, cultural and morphological characters, staining reactions, and effect upon the animal body, of this group of bacilli. Emphasis is laid on the necessity of exercising particular care in making cultures from suspicious material in order to avoid confusing acid-fast bacilli of nonpathogenic nature with virulent tubercle bacilli, which they closely resemble in almost every respect except virulence. It has been asserted by some investigators that these acid-fast bacilli may produce pathological effects which closely resemble those of tuberculosis. The author therefore undertook a number of experiments in inoculating guinea pigs, rabbits, mice, chickens, and pigeons with these organisms. In none of the experiments was there any pathological process established which possessed a progressive character and which involved all of the internal organs. The bacteria with which experiments were made, however, appeared to exercise a pathogenic action to a certain extent. The effect of these bacilli, however, appears not to be in the nature of a true infection, but rather that of a foreign body. During the experiments in subcutaneous inoculation of guinea pigs it was found that the organisms did not remain at the point of inoculation and in the neighboring lymphatic glands but were carried into the internal organs, presumably through the agency of phagocytes. In the latter situation the organisms may produce slight alterations of the tissue. Small yellowish foci were found in the liver of the animals 4 months after inoculation. From this material bacteria were again obtained in pure cultures. Close observation of the conditions, however, shows that the number of organisms present in inoculated animals gradually diminishes.

Combating tuberculosis in hogs by means of tuberculin tests, Thiro (*Deut. Thierärztl. Wchnschr., 10 (1902), No. 12, pp. 113-116*).—Fatal epizootics were observed by the author in a number of herds of pigs. In such outbreaks many young sucking pigs were fatally affected, and the owners of the herds were finally prevailed upon to permit the general application of the tuberculin test to the brood sows. During these experiments it was found that the normal temperature of hogs varied from 37.6 to 40.6° C. in different animals, with an average of about 39.8° C. In a number of pigs tuberculosis could be diagnosed from external symptoms without the tuberculin test. Tuberculin injections, however, were made without reference to the extent of the disease. According to the author's observations tuberculosis was found in a number of forms, including alimentary tuberculosis with gradual emaciation, anemia, arched back, pulmonary tuberculosis with short, dry cough and rapid breathing, and cerebral tuberculosis accompanied with spasms, paralysis, and falling fits. The rise of temperature in tuberculous pigs after tuberculin injection ranged from 1½ to 3° C. The author considers that a rise of 1° C. is necessary in order to be sure of the presence of tuberculosis. In adjusting the amount of tuberculin to the size or age of the hog, the author found it desirable to disregard the size and administer doses according to age. The following doses are recommended: For pigs 4 months old, 0.1 cc.; 9 months old, 0.15 cc. to 0.2 cc.; 18 months old, 0.25 cc.; older animals, 0.3 cc. Of the 87 hogs which were inoculated 24 reacted, and of these 24, 21, or 88 per cent, were found to be tuberculous.

Observations on the electrical resistance and index of refraction of tetanus toxin, Dongier and Lesage (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 6, pp. 329, 330*).—During a series of experiments with cultures of tetanus bacillus it was found that when this organism was cultivated in bouillon the electrical resistance of the medium was somewhat reduced. This effect persisted after the bacilli had been removed by filtration. It appears, therefore, that the diminution in electrical resistance is due to changes produced in the medium by the growth of the tetanus bacillus. No characteristic differences in the index of refraction were observed in media in which tetanus bacillus was growing or in the same material after boiling.

The disappearance of anthrax bacilli in normal lungs, J. J. Snel (*Ztschr. Hyg. u. Infectionskrank., 40 (1902), No. 1, pp. 103-133*).—A critical discussion of the literature of this subject is given in connection with a bibliography of 50 titles. The author's experiments were designed to obtain evidence in the question of frequency of infection of normal lungs by bacteria floating in the atmospheric air. At first experiments were made with a Pravaz syringe which was inserted between two rings of the trachea. It was found, however, that an infection took place in every case through the wound. Experiments of a similar nature were tried after exposing a portion of the trachea and burning an opening with a small needle. The same results occurred as with the first-named method. The attempt was then made to introduce cultures in gelatin tubes, leaving the tubes in the opening in the trachea. It was believed that infection by the previous methods had taken place while the needle or syringe was being removed. In experiments with the gelatin tubes, however, the wound infection regularly took place. The experimental animals in these and the succeeding experiments were guinea pigs, and the organism with which the experiments were made was the anthrax bacillus obtained from a case of malignant pustule in man. When it appeared certain that satisfactory experiments could not be made by injection directly through the trachea, anthrax bacilli were injected into the upper end of the trachea through the mouth, care being exercised not to cause any injury to the mucous membrane. It was found that all possible precautions must be exercised even in the application of this method to prevent abrasion of the membrane of the mouth or trachea. In the cases in which no lesion of the mucous membrane was produced, no infection of anthrax took place. In all, 20 guinea pigs were inoculated into the lungs, and 8 of them were allowed to live for a week or longer after inoculation. The experimental animals were killed at different periods after inoculation. It was found that the virulence of the anthrax bacilli was still of normal strength after 1 hour. After being 4 hours in the lungs of the guinea pigs, however, the bacilli showed changes of form and had lost the power of growth. It appeared that they had become so weakened by remaining for a short time in the lungs that they had no power of development upon artificial nutrient media. As a rule, some evidence of pneumonia was observed in the lungs. Similar experiments with anthrax spores showed clearly that the spores also are destroyed by being left in the lungs. Animals which were allowed to live recovered permanently from the temporary bad effects of the inoculation.

Is is concluded from these experiments, therefore, that in the normal lungs of guinea pigs anthrax bacilli are destroyed, although these animals always died if the anthrax bacilli obtained entrance into the subcutaneous tissue.

Immunization against anthrax with pyocyanase, and combinations of this enzym, K. VAERST (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), Nos. 7, Orig., pp. 293–317; 8, pp. 348–355*).—The author reviews the literature of this subject in a critical manner, in connection with a bibliography of 67 titles. An account is given of the various methods which have been used in producing immunity in various domesticated animals against anthrax. Since it had been demonstrated that the enzym from *Bacillus pyocyaneus*, commonly called pyocyanase, exercised an immunizing action against anthrax, numerous experiments were made with this substance to determine its relative value and the conditions under which it was most effective. The author conducted a large series of experiments in the laboratory, outside of the animal body and in the animal body. The experiments with animals included simultaneous injection of pyocyanase and anthrax bacillus; immunizing experiments with aqueous solution of pyocyanase in the proportion of 1 to 10; immunizing experiments with pyocyanase and immune proteids obtained from the serum and from the spleen; and immunizing experiments with pyocyanase solution and dead anthrax bacilli. The results of these experiments upon different experimental animals are recorded in detail. As a result of the experiments it is concluded that pyocyanase exercises, not only a restraining influence upon the development of anthrax cultures, but may actually dissolve the bacteria. In making simultaneous injections of anthrax cultures and pyocyanase the development of anthrax in the animal body may be checked. It was not found possible to immunize rabbits against anthrax by means of an aqueous solution of pyocyanase. The author succeeded, however, in immunizing rabbits with pyocyanase serum.

Texas cattle fever and salt sick, C. F. DAWSON (*Florida Sta. Bul. 64, pp. 519–550, figs. 3*).—A general account is presented of the cause, symptoms, post-mortem appearances, and historical pathology of Texas fever, together with notes on the life history of the cattle tick, means of exterminating the tick, and methods of immunization of cattle by tick infestation and by blood inoculation. The author believes that the best way to prevent Texas fever in native animals is to infest them mildly with ticks in early life. Medical treatment of Texas fever is usually without results in acute cases. In chronic cases the author had good results from the use of a condition powder containing 8 oz. linseed meal, 4 oz. powdered fenugreek seed, 3 oz. ginger root, 4 oz. common salt, 2 oz. hyposulphite of soda, and 1 oz. sulphate of iron. The different substances were mixed together and the dose given was a handful in bran night and morning.

The author investigated a number of cases of so-called salt sickness, and found that this disease may affect cattle at any age, but more frequently attacks calves and yearlings. In all cases of this disease which were investigated the organism of Texas fever was found in the red blood corpuscles. It is believed therefore that salt sickness is really a chronic form of Texas fever, in which excessive infestation of ticks and poor pasture may result in producing an unusual degree of emaciation. It is believed that salt sickness may be the same as the so-called wasting disease which was investigated in Jamaica.

Texas fever, I, G. E. Nesom (*South Carolina Sta. Bul. 72, pp. 23*).—Brief popular notes are given on the subject of Texas fever, including the following points: The introduction, history, distribution, cause, method of infection, and period of incubation of this disease, together with a discussion of susceptibility, favorable conditions, symptoms, post-mortem appearances, treatment, prognosis, dipping of cattle, and preventive vaccination. From circulars sent to stock raisers in the State it was found that among 3,408 cattle mentioned in answers to the letters, 1,885 or 55.3 per cent were infested with cattle ticks, while the remainder were entirely free from them. Attention is called to the importance of these facts in the development of Texas fever.

Report upon Texas fever or red water in Rhodesia, C. E. Gray and W. Robertson (*Cape Town: Argus Printing and Pub. Co., Ltd., 1902, pp. 27, pls. 22*).—An account is given of the history of Texas fever in Rhodesia. The origin of the first cases of Texas fever in this province is not definitely known. During the past 10 years the country has become gradually infected until the epizootic proportions of the seasons of 1901 and 1902 were reached. Texas fever in Rhodesia appears, according to the observations of the authors, to differ from the same disease in other countries in the severity of infection, in the fact that very young calves on infected fields contract the disease and die, and also in the facts that 1, 2, or even 3 attacks do not confer immunity and that about 30 per cent of the cases exhibit serious lesions in the lungs. The symptoms of typical and atypical cases are described in detail. In all these cases the disease ran a virulent course, but in atypical cases the lungs are seriously affected. They become heavy and darker in color than normal, and are filled with fluid and froth. Just before death in such cases large quantities of albuminous froth are discharged from the nose. Extensive experiments in the use of a drench containing 1 dr. calomel, 1 dr. carbolic acid, 2 dr. quinine, and 1 pt. linseed oil showed that this remedy is of little value. Inoculation experiments also gave unsatisfactory results. It was found that the virulence of the blood of recovered animals varied greatly and in many instances was fatal when inoculated in small doses. It was also found impossible to protect inoculated animals during the period required for the production of immunity. Many such animals, therefore, died from the combined effects of inoculation and excessive tick infestation. Even in cases where the reaction from inoculation was typical and where the animals recovered within the usual length of time, the immunity seemed to be of variable duration and in many cases was not sufficient to protect the inoculated animals. It is apparent, therefore, that the methods which have been used in America and Australia in immunizing cattle against Texas fever can not be used at present without modification in Rhodesia. Further experiments will be made along this line and experiments are already in progress in devising effective dips for destroying the ticks. The authors recommend the use of a dip containing 6 lbs. arsenic, 24 lbs. soap, 24 lbs. washing-soda crystals, 5 gal. Stockholm Archangel tar, and 400 gal. of water.

Red water in Rhodesia, H. Watkins-Pitchford (*Agr. Jour. and Min. Rec.* [*Natal*], *5* (*1902*), *No. 11, pp. 341–347*).—An outbreak of the disease was observed in cattle imported into Rhodesia and an examination of the disease showed that it was identical with that known as red water in Natal. The outbreak is attributed to the presence of an unusual number of ticks and the introduction of a number of animals possessing an extreme degree of susceptibility. For the purpose of preventing the further spread of the disease it is recommended that the introduction of stock from Rhodesia into Natal be prohibited until the disease has been checked. It is not considered necessary to make this prohibition a permanent matter. Immunity, when once acquired, appears to be lasting or permanent. During the author's investigations on this subject it was found that the period of incubation and the intensity of the disease were the same whether the animals were exposed to tick infection or inoculated with virulent blood.

Texas fever and the rôle of buffaloes and zebus in hot, unhealthy regions, R. Marès (*Jour. Agr. Prat., n. ser., 4 (1902), No. 29, pp. 75–80, figs. 4*).—Since all races of domestic cattle in Algeria, and especially the imported breeds, are more or less susceptible to Texas fever, attempts have been made to obtain breeds by crossing and otherwise which are resistant to this disease. Incidentally during the work along this line it was found that buffaloes of that country were naturally immune to Texas fever. Brief notes are given on the economic value of these animals. It is stated that they do not cross with domestic cattle, and that their habit of remaining near water during the warm months makes the provision of suitable pasturage rather difficult. The zebu is equally resistant to Texas fever and crosses readily with domestic cattle. All such crosses, even those which have but the slightest trace of zebu blood, are immune to Texas fever. The crosses are described as fairly good beef animals and animals of burden.

Rinderpest in South Africa, D. Hutcheon (*Agr. Jour. Cape Good Hope, 21 (1902), No. 3, pp. 211–221*).—In consequence of the continued occurrence of this disease in South Africa the author has prepared a report containing information on all the features of this disease which are especially interesting to stockmen. A history of outbreaks of rinderpest is given, the symptoms and course of the disease are described, and notes are given on various unsuccessful attempts which have been made to treat it medicinally. Special attention is given to the vaccination of susceptible cattle by inoculation of bile taken from an affected animal. Detailed directions are given with regard to methods of obtaining this bile and of making the operation. Other methods of vaccination are mentioned, such as the use of serum and defibrinated immune blood.

Blackleg and contagious abortion, D. F. Luckey (*Bul. Missouri State Bd. Agr., 2 (1902), No. 5, pp. 13–23*).—Brief notes are given on the symptoms and transmission of blackleg and on the method of vaccinating animals to protect them against this disease. In the discussion of contagious abortion attention is chiefly called to the nature of the disease and to the methods of disinfecting aborting animals and premises on which the disease has occurred.

Foot-and-mouth disease, D. E. Salmon (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 38, pp. 3*).—Attention is called to a recent outbreak of foot-and-mouth disease in certain localities in Massachusetts and adjacent States. Notes are given on the nature and symptoms of the disease and on the importance of exterminating it. It is believed that the present outbreak can be completely controlled and eradicated. Notes are also given on the means by which the disease may be spread, and on the practical measures which stock owners may adopt in protecting their animals.

Heart water in calves, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 21 (1902), No. 3, pp. 221, 222*).—The author has continued his experiments with regard to the nature and relationship of this disease, and finds that apparently so-called calf disease and heart water are identical. At any rate, an attack of calf disease confers resistance to heart water, and the converse of this statement is also true. The experiments show also that the disease is carried by pathogenic ticks.

The plague of ticks; their destruction by oil spraying, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 21 (1902), No. 4, pp. 337–345, pls. 4*).—The injury to live stock from infestation with the common blue tick, bont tick, and dog tick is at times exceedingly serious and under ordinary circumstances is an important factor in success in stock raising. Stock raisers of Cape Colony first attempted dipping experiments, but without satisfactory results. A number of spraying experiments were then tried with different materials, until finally kerosene oil proved to be the most effective and satisfactory. For spraying cattle, horses, and mules for tick infestation the animals are driven into narrow chutes in which they can be easily restrained and the oil is then applied by means of a spray produced by a force pump. On an average 60 animals per hour may be sprayed in a single chute. Five or six men are required for this work to manage the animals and operate pumps and sprays on both sides of the chute. As a rule only the lower portions of the animal are sprayed, including the dewlap, tail, feet, legs, and lower surface of the body. This is usually sufficient on account of the fact that the bont ticks do not occur in large numbers on the upper surface of the body. If, however, blue ticks are abundant upon the cattle the whole surface of the body is sprayed. In these spraying experiments mechanical mixtures of oil and water were soon used to replace spraying with pure oil. Good results were obtained from the use of a 15 to 25 per cent mixture. It has been found that 10 gal. of a mixture containing 20 per cent of oil is sufficient for 100 cattle. The usual interval between sprayings is 12 to 14 days. It is believed that the spraying must be continued for a number of years and at frequent intervals during the summer in order to rid the country of the present superabundance of ticks. The effect of the oil upon the ticks is manifested within an hour, and by the following day the majority of the ticks are dead and partially dried. The oil as a rule has no injurious effect upon the animals.

Cattle dipping tanks (*Agr. Jour. and Min. Rec. [Natal], 5 (1902), No. 10, pp. 301, 302, pl. 1*).—A description is given, accompanied with illustrations, of a cattle dipping plant in operation for the destruction of the ticks which carry Texas fever.

Preventive treatment of sheep scab, F. J. Bosc (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 9, pp. 405, 406*).—The author had previously shown the possibility of immunizing sheep against infection from sheep pox. Further experiments were made during which the author employed serum obtained from over-immunized lambs. It was found to be desirable to choose lambs from ewes which had not been immunized to this disease. The serum of lambs treated with attenuated virus was found to possess immunizing properties when used in doses of 10 to 20 cc.

Report of the chief inspector of sheep for the year 1901, A. G. Davison (*Agr. Jour. Cape Good Hope, 21 (1902), No. 1, pp. 29–33*).—On account of the unsettled condition of Cape Colony, little progress was made during the past year in eradicating sheep scab and the disease appeared in a number of herds where it had not previously been noted. In order to control the outbreaks of sheep scab in the future the author recommends the appointment of competent men as sheep inspectors, dipping of all stock under supervision, division of the whole country into districts, the disinfection of corrals and premises, and the institution of brands and ear marks.

Glanders, S. B. Woollatt (*Agr. Jour. and Min. Rec. [Natal], 5 (1902), No. 14, pp. 429–433*).—On account of the great prevalence of glanders in Natal and in general throughout South Africa the author prepared a brief account of the symptoms, modes of infection and spread, period of incubation, different forms, and methods of treatment of glanders. Among the horses examined cases of glanders were found in horses from the late Orange Free State and in shipments from Europe, Canada, United States, and Australia.

Hygiene of domesticated animals, H. George (*Jour. Agr. Prat., n. ser., 4 (1902), No. 35, pp. 275–277*).—Brief notes on mechanical obstruction of the esophagus in mules and on outbreaks of swine erysipelas.

Distemper in dogs; statistics on vaccination against this disease from May 15, 1901, to May 15, 1902, C. Phisalix (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 21, pp. 1252–1254*).—The author presents an account of the method which he adopted for vaccinating young dogs against distemper. It was found that vaccination produced a high degree of resistance against both natural and artificial infection. As the result of extensive experiments with this method it was found that the mortality in dogs thus treated was only 2.8 per 100, while in dogs which were not vaccinated the mortality varied from 40 to 80 per 100.

Rabies, or hydrophobia, W. Robertson (*Agr. Jour. Cape Good Hope, 21 (1902), No. 4, pp. 307–314*).—Rabies is said to have appeared first in South Africa at Port Elizabeth, where it was quickly exterminated. The country has recently become reinfected, however, on account of the large number of dogs which are kept by natives to the north of the English provinces. Notes are given on the cause, symptoms, and treatment of this disease.

Rabies, S. B. Woollatt (*Agr. Jour. and Min. Rec.* [*Natal*], *5* (*1902*), *No. 15, pp. 461–466*).—On account of the recent appearance of rabies in Rhodesia the author presents brief notes on the symptoms, period of incubation, and post-mortem appearances of the disease, together with an account of a method of protective inoculation against it.

Roup, F. C. Harrison (*Ontario Agr. Col. and Expt. Farm Bul. 125, pp. 16, figs. 10*).—A general account is presented of the economic importance, symptoms, course, and treatment of this disease. A number of experiments and observations were made by the author, during which it was shown that roup could be communicated from diseased to healthy fowls by association in the same pen, or as the result of rubbing pathological membranes from diseased birds upon the mucous membranes of healthy birds. In the study of the bacteriology of roup it was found exceedingly difficult to isolate any organism which would produce the symptoms of roup when inoculated in healthy fowls. After fruitless experiments extending over a period of 4 years an organism was isolated which causes roup. The author has named this organism *Bacillus cacosmus*. The bacillus in question is frequently associated with other organisms in the form of a mixed infection. The author does not think it possible, therefore, to devise a practical treatment by serum. Notes are given on a number of curative methods which have been tried, including the use of boracic acid, corrosive sublimate, permanganate of potash, etc.

Fowl typhoid, C. Curtice (*Rhode Island Sta. Bul. 87, pp. 16*).—An outbreak supposed to be fowl cholera was reported in a number of flocks of poultry in the fall of 1901. In one case an outbreak occurred among 2,000 chickens and resulted in the death of 25 per cent. A bacteriological investigation of material obtained from these cases was made by Dr. Theobald Smith, and the present bulletin is partly based upon his notes. The spleen of fowls affected with the disease was somewhat enlarged, and the specific organism was found in the spleen, associated also with *Bacillus coli communis*. The organism of the disease is a short, oval, nonmotile rod, which gives no indol reaction. Experiments with animals showed that rabbits and chickens were susceptible to the disease, but that guinea pigs were apparently refractory. The disease was successfully transmitted to hens by feeding pure cultures, and also by feeding the viscera of diseased hens. The organism is said to differ decidedly from that of fowl cholera. Chickens affected with the disease usually die within 2 weeks after the attack. A diagnosis is difficult or impossible without a bacteriological study. No medical treatment is effective. Sanitary measures are recommended, including isolation of diseased fowls and the use of disinfectants. It is recommended that a plan of rotation of crops be adopted and that the chicken houses be moved from place to place in accordance with this plan.

Vaccination against pasteurelloses, J. and M. Lignières (*Compt. Rend. Acad. Sci. Paris, 134* (*1902*), *No. 20, pp. 1169, 1170*).—An extensive series of experiments was made in immunizing horses to typhoid fever and pneumonia, fowls and rabbits to fowl cholera, dogs to distemper, and cattle and sheep to hemorrhagic septicemia. About 70,000 sheep were vaccinated against the last-named disease. In attenuating the organism the author made use of cultures which had been maintained on artificial media for about 500 generations. The first vaccine was obtained from cultures subjected to a temperature of from 42 to 43° C. for 5 hours, while the second vaccine came from cultures subjected to the same temperature for 2 hours. It was found that $\frac{1}{4}$ cc. is sufficient to vaccinate dogs, while $\frac{1}{2}$ cc. was required for calves and pigs, and $\frac{3}{4}$ cc. for cattle and horses. Vaccinated animals resisted infection from inoculation which was fatal to the control animals.

The production of a polyvalent preventive and curative serum for treatment of the pasteurelloses, Lignières and Spitz (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 23, pp. 1371–1373*).—Attention is called to the fact that preventive serum treatment has been successfully devised in the case of fowl cholera, swine plague, and other diseases belonging to this class. A monovalent serum prepared from a single species of these organisms operates as a preventive and curative for all of the diseases of this class. By a series of experiments conducted with horses the author determined that immunizing products could be obtained from these animals, after being subjected to inoculation with virus of several kinds, and that this serum was effective in subcutaneous doses of 5 to 10 cc.

Liver disease (tuberculosis) of poultry, A. Meek (*Jour. Bd. Agr. [London], 9 (1902), No. 2, pp. 189–192*).—Notes are given on the distribution, symptoms, postmortem appearances, etiology, and methods of prevention of tuberculosis of fowls. It is believed that the present great prevalence of this disease is partly due to ignorance as to its nature and consequent indifference as to means of controlling it.

Sorghum poisoning, H. Tryon (*Queensland Agr. Jour., 11 (1902), No. 4, pp. 282, 283*).—Brief notes are given on the finding of prussic acid in sorghum, especially in young plants. A short abstract is also presented of an article on cyanogenesis in plants, by W. R. Dunstan and T. A. Henry.

Grazing in orchards sprayed with poisonous washes (*Jour. Bd. Agr. [London], 9 (1902), No. 2, pp. 193–195*).—Spraying experiments were conducted for the purpose of testing the question of the possibility of stock poisoning as the result of using arsenical and other insecticides and fungicides. Two acres of young fruit trees were sprayed with Paris green, the grass between the trees being sprayed as well. A number of sheep were allowed to graze on this grass and no evidence of any injurious effect was observed.

The bactericidal and disinfecting action of Lysoform, O. Seydewitz (*Centbl. Bakt. u. Par., 1. Abt., 32 (1902), No. 3, Orig., pp. 222–234*).—Lysoform is said to consist of formalin, soap, and a small quantity of ethereal oil dissolved in alcohol. The author tested its bactericide power on a number of bacteria, including the organisms of typhoid, anthrax, cholera, diphtheria, puerperal fever, and also *Staphylococcus pyogenes aureus*. Lysoform was found to be a valuable disinfectant. It requires, however, more time to produce its effects than many other well-known disinfectants. In the case of anthrax spores growth was prevented by subjecting these organisms to a 1:1500 solution of Lysoform for a period of 8 days. However, a culture of anthrax bacillus in bouillon was not destroyed during a period of 8 days, except when exposed to a concentration of 1:100 of Lysoform.

The bactericidal action of soaps, D. Konradi (*Arch. Hyg., 44 (1902), No. 2, pp. 101–112*).—A test was made of the disinfecting power of a number of soaps with regard to certain species of pathogenic bacteria, especially anthrax bacillus. It was found that certain soaps, especially those which contain certain odorific materials, were complete disinfectants. As a test of this problem the author smeared anthrax cultures on the hands and then washed the hands with so-called Resorcin soap with the result that all of the anthrax bacilli were destroyed.

AGRICULTURAL ENGINEERING.

Irrigation, F. H. Newell (*Twelfth Census United States, Census Rpts., vol. 6 (Agriculture, pt. 2), pp. 799–880, pls. 9, figs. 35*).—The history of irrigation in America is briefly reviewed; the present area of irrigated land, extent and measurement of the water supply, planning and construction of irrigation systems, methods of irrigation, pumping, drainage, waste of water, duty of water, and alkali are discussed; and general statistics of irrigation in the various States and Territories in the arid and humid regions are given.

"Exclusive of the rice-producing States, the Territory of Hawaii, and Indian reservations, the number of irrigators in the United States in 1899 was 108,218, an increase of 54,082, or 100 per cent, over the number reported in 1889. The number of acres irrigated was 7,539,545, an increase during the 10 years of 3,908,165, or 107.6 per cent. Of the total irrigated area, 5,944,412 acres were in crops, and the total value of the products therefrom was $86,860,491. The total cost of construction of the irrigation systems operated in 1899 was $67,770,942. . . . In the number of irrigators California stands far ahead of any other State, having about one-fourth of the total number in the United States. Colorado, however, exceeds in the number of acres irrigated, although not in the value of irrigated crops."

Of the total irrigated area, 7,093,629 acres were watered from streams, and 169,644 acres from wells. The number of acres in crops irrigated in 1899 was 5,711,965, and the number of irrigated acres in pasture and unmatured crops was 1,551,308. The value of the irrigated crops was $84,433,438. . . . Of the irrigated area, 7,263,273 acres was in the arid States, 273,117 acres in the semiarid region, and 3,155 in the humid region.

Problems in farming by irrigation, S. AVERY (*Agriculture [Nebraska], 1 (1903), No. 11, pp. 9–12*).—A brief discussion of questions relating to water rights, distribution of water, alkali, etc.

Irrigation on a Sussex farm (*Country Life [London], 12 (1902), No. 311, pp. 797–799, figs. 5*).—Describes a method of irrigating grass and grain by means of a 10-in. centrifugal pump driven by steam, the water being delivered through 10-in. canvas hose.

Irrigation on the Burdekin Delta (*Queensland Agr. Jour., 12 (1903), No. 1, pp. 49–59, pl. 1, fig. 1*).—The possibilities and present development are discussed.

Prospect for irrigation on the Colorado River, F. H. NEWELL (*Forestry and Irrig., 9 (1903), No. 2, pp. 72–74*).

Completion of the Nile dams, J. WARD (*Cassier's Mag., 23 (1903), No. 4, pp. 549–551, figs. 10*).—Descriptions of the Assiout and Assuan dams.

Projects for water conservation, irrigation, and drainage in New South Wales, H. G. McKINNEY (*Jour. and Proc. Roy. Soc., New South Wales, 35 (1901), pp. 223–242*).—A number of proposed systems of water supply and conservation are discussed.

A simple home-made water lift, A. H. BENSON (*Queensland Agr. Jour., 12 (1903), No. 1, pp. 45, 46, pl. 1*).

Agricultural implements in France, R. P. SKINNER (*Amer. Inventor, 10 (1903), No. 6, pp. 91–93, figs. 11*).—Descriptions are given of some of the types of machines and implements in common use in France and suggestions are made as to how American manufacturers may increase their trade there, especially by giving more attention to adapting their machines and implements to the limitations and distinctive features of continental methods.

On official trials of farm machinery, F. BOKELMAN (*Tidsskr. Landökon., 21 (1902), No. 5, pp. 297–331*).

Trials of agricultural machinery in Ultuna (*Landtmannen, 13 (1902), Nos. 48, pp. 761–767; 49, pp. 777–779; 50, pp. 805–807; 51, pp. 814–818*).

On the application of electricity in agriculture, C. V. BIRK (*Tidsskr. Landökon., 21 (1902), No. 7, pp. 413–452*).

The technical machine testing station of the Institute for the Fermentation Industries in Berlin (*Deut. Landw. Presse, 30 (1903), No. 9, pp. 68, 69, fig. 1*).—A brief note on the equipment and work of this station.

Equipment and processes employed in agricultural operations, A. HIDIEN (*Rapport sur le matérial et les procédés des exploitations rurales. Exposition Universelle Internationale de 1900, group 7, class 35. Min. Com., Ind., Postes, et Télégraphes, France, 1902, pp. 492, figs. 100*).—This includes reports on the exhibits made at the Paris Exposition of 1900 of agricultural implements and machinery, by the author; in veterinary science and farriery, by A. Lavalard, and in fertilizers, by H. Joulie.

Granaries of the General Transportation Company of Paris, F. MAIN (*Jour. Agr. Prat., n. ser., 5 (1903), No. 4, pp. 118–120, figs. 2*).—Describes granaries arranged so as to secure mechanical stirring of the grain, constructed on the same principle as those previously noted (E. S. R., 14, p. 196).

MISCELLANEOUS.

Thirteenth Annual Report of Arizona Station, 1902 (*Arizona Sta. Rpt. 1902, pp. 233–270*).—This includes the organization list, a financial statement for the fiscal year ended June 30, 1902, and reports of the director and heads of departments noted in part elsewhere.

Fifteenth Annual Report of Indiana Station, 1902 (*Indiana Sta. Rpt. 1902, pp. 24*).—This contains the organization list and reports of the director and members of the station staff. A list of station publications issued during the year, acknowledgments, and a financial statement for the fiscal year ended June 30, 1902, are included.

Fifteenth Annual Report of New York Cornell Station, 1902 (*New York Cornell Sta. Rpt. 1902, pp. XLIII + 433*).—The report proper includes the organization list of the station, brief reports of the director and heads of departments, and a financial statement for the fiscal year ended June 30, 1902. Appendix I contains reprints of Bulletins 194–202 of the station on the following subjects: The Hessian fly—its ravages in New York in 1901 (E. S. R., 13, p. 572), further observations upon ropiness in milk and cream (E. S. R., 13, p. 686), fourth report on potato culture (E. S. R., 13, p. 734), investigations concerning the germicidal action in cow's milk (E. S. R., 13, p. 783), orchard cover crops (E. S. R., 13, p. 951), separator skimmed milk as food for pigs (E. S. R., 13, p. 1079), muskmelons (E. S. R., 14, p. 40), buying and using commercial fertilizers (E. S. R., 14, p. 23), and trap lanterns, or "moth-catchers" (E. S. R., 14, p. 272). Appendix II contains a detailed financial statement for the fiscal year ended June 30, 1901. Appendix III contains a circular of information on the reading course for farmers; reprints of Reading Lessons for Farmers' Wives Nos. 3–5; Home Nature Study Course Nos. 16–24; nine numbers of the Junior Naturalist Monthly issued during 1901 and 1902; and a syllabus of lectures on nature study.

Annual report of the director, H. P. ARMSBY (*Pennsylvania Sta. Bul. 61, pp. 12*).—The different lines of station work are briefly outlined, mention is made of needed equipment, and the income of the station from different sources is compared with that of a number of other stations.

Fifteenth Annual Report of South Carolina Station, 1902 (*South Carolina Sta. Rpt. 1902, pp. 20*).—This includes the organization list of the station, a financial statement for the fiscal year ended June 30, 1902, departmental reports, and a brief synopsis of the bulletins issued during the year. The report of the chemist contains a summary of the analyses of fertilizers inspected during 1901 and 1902.

Crop Reporter (*U. S. Dept. Agr., Division of Statistics Crop Reporter, 4 (1902), Nos. 7, 8; 4 (1903), No. 9, pp. 8 each*).—These numbers contain statistical information on the condition of crops in the United States and foreign countries. No. 7 includes a report on crop conditions in the different States and Territories on November 1, 1902. No. 9 includes a letter from the Secretary of Agriculture to Congress upon the advisability of consolidating with the Weather Bureau the work of gathering reports and statistics of crops. Consolidation is considered inadvisable.

Statistics of agriculture (*Twelfth Census United States, Census Rpts., vols. 5 (Agriculture, pt. 1), pp. CCXXXVI+767, pls. 19; 6 (Agriculture, pt. 2), pp. 880; pls. 19*).—Part 1 deals with farms, live stock, and animal products, and part 2 with crops and irrigation. The statistics relating to special lines of agriculture are noted elsewhere in this issue. The agricultural progress in the United States during the last 50 years is reviewed. The number of farms in 1850 was 1,449,073, and in 1900, 5,739,657. The census shows a total value of farm lands and buildings in 1900 of $16,674,690,247, of which 21.4 per cent was in buildings. The farms are classified by area, principal source of income, value of products of 1899 not fed to live stock, tenure, and by color or race of farmer. Of the total number of farms, 3,806,414 contained each 50 acres or over. Of the total number, 54.9 per cent was operated by owners, 22.2 per cent by share tenants, 13.1 per cent by cash tenants, 7.9 per cent by part owners, 0.9 per cent by owners and tenants, and 1 per cent by salaried managers or overseers. White farmers operated 86.6 per cent of the total number of farms. The total value of animal products in 1899 was estimated at $1,718,990,221, and the total value of all crops, including forest products, at $3,020,128,531. The number of persons making agriculture their principal occupation was 10,438,121.

Cotton manufactures, E. STANWOOD (*Twelfth Census United States, Census Bul. 215, pp. 56*).—In 1900 cotton manufactures represented a capital of $460,842,772, invested in 973 establishments and including the value of land, buildings, machinery, tools, and implements, exclusive of the capital stock of any of the corporations. The products of the industry represented a value of $332,806,156. The figures for the manufacture of cotton small wares are not included in the above statement. Of this class there were 82 establishments with a capital of $6,397,385, with products amounting in value to $6,394,164. The total value of products in 1900 was 5.5 times as much as in 1850. The industry was then the leading manufacturing interest of the country and still holds that rank. Detailed statistics of the industry, including such items as imports and exports, the growth of the industry from decade to decade, its geographical distribution, the number of employees and their wages, together with other important data, are given in tables.

Historical development and present condition of agriculture in Roumania, C. JORMESCU (*Inaug. Diss., Univ. Bonn, 1901, pp. 151*).

Changes in agricultural management in Wurttemberg during the latter half of the nineteenth century, F. FRANCK (*Inaug. Diss., Univ. Jena, 1902, pp. 100, map 1*).—This work treats mainly of the changes which have taken place during the period in the acreage cultivated by the individual farmer, and in the conditions affecting the culture of crops and the raising of live stock.

Decreasing the culture of grain in favor of stock raising, E. VON RECHENBERG (*Inaug. Diss., Univ. Jena, 1902, pp. 79*).—This treatise compares the results of grain farming and stock raising and discusses under what conditions either the one or the other is profitable. A general review of agricultural conditions in Germany is also given.

Determination of net profits in agriculture, L. HUSCHKE (*Inaug. Diss., Univ. Jena, 1901, pp. 43*).—The economic phase of farming is considered in detail and calculations showing the net profits for small, medium, and large farms under conditions existing in middle Thuringia are presented. This dissertation forms part of a report on the conditions of German agriculture. An investigation of this subject was authorized by the Government.

Nature study (*Ontario Agr. Col. and Expt. Farm Bul. 124, pp. 79, figs. 96*).—This bulletin includes a series of articles written by members of the staff of the Ontario Agricultural College for the purpose of presenting "items of information and simple commonplace incidents regarding natural objects, in the hope of interesting . . . young people and inducing teachers to undertake such work in the Public and High Schools of the Province." The following subjects are discussed in a way which enables young readers to understand them: The origin, composition, and use of soil; the growth of plant roots; the growth of wheat; bread making; the yeast plant; butter making; bee keeping; apple growing; sugar production from the maple tree and the sugar beet; poultry raising; the cabbage butterfly; a number of common birds, and horse training.

NOTES.

Alabama College and Station.—By a law recently enacted by the State legislature R. S. Mackintosh, horticulturist, has been made ex-officio State horticulturist. Fifteen hundred dollars per annum is appropriated to the college to enforce rules and regulations looking to the protection of fruit trees, vegetables, etc., against the San José scale, and insect pests in general. All nursery stock sold in Alabama by dealers within or without the State must carry the certificate of the State horticulturist. Jesse Jones, of Manhattan, Kans., succeeds R. W. Clark as assistant agriculturist.

Arizona Station.—The Territorial legislature, during the session just ended, appropriated $11,000 for the use of the station, to be expended particularly for the benefit of the date orchard and the station farm and for the dissemination of the results of the station work throughout the Territory by means of publications, farmers' institutes, and short courses of instruction. This appropriation places the station prospectively in a thoroughly satisfactory condition in all of its departments.

Colorado College and Station.—L. G. Carpenter, professor of civil and irrigation engineering in the college and director of the station, has been appointed State engineer.

Florida Station.—Geo. F. Mitchell has been appointed assistant in field experiments.

Indiana Station.—A newspaper report states that Arthur Goss, chemist of the New Mexico College and Station, has been elected director of the station, vice H. A. Huston, resigned.

Massachusetts College and Station.—Ralph E. Smith, assistant botanist, has resigned to accept the position of plant pathologist at the California University and Station, and entered upon his new duties early in April. The State legislature has appropriated $20,820 for the college, $16,605 of which is for the completion of the new dining hall and central heating plant, $1,115 for maintenance to cover the deficit in the income from the United States land grant, $1,600 for fitting up an agricultural laboratory, $500 for walks, $500 annually for the maintenance of the heating and lighting plant, and the same amount for the dining hall. The bill providing a new feeding-stuffs law, previously mentioned, has been passed.

Missouri College and Station.—The State legislature has just appropriated to the college and station $62,600 for the following improvements and extensions: Veterinary hospital for contagious diseases, $15,000; barn, $10,000; improved live stock, $5,000; plant house for work in plant physiology and pathology, $7,500; additional equipment for dairy, horticulture, and live-stock buildings, $9,000; experiment station, $10,000. Provision has been made for an additional instructor in each of the following departments: Veterinary medicine, entomology, horticulture, botany, and extension work. The law concerning the manufacture and sale of commercial fertilizers was revised to relieve the station of the duty of analyzing samples of all the fertilizers before they were placed upon the market, and now requires the station to select samples in the open market and analyze the same. The analytical fee was abolished and the price of tags increased from 1 cent to $1\frac{1}{2}$ cents each for packages of 100 lbs. or less, and 3 cents each for packages weighing more than 100 lbs.

Montana College and Station.—At the session of the State legislature just closed an appropriation of $5,000 a year was made for the maintenance of the station, $5,500 for a central heating plant for the experiment station and agricultural buildings, $3,000 for a seed house and granary, and $13,000 for a cattle and dairy barn. These added facilities will strengthen both the college and station departments of agriculture and permit of developing lines of work for which there is very much need in the State, notably dairying.

New Hampshire College and Station.—C. S. Murkland, president of the college, has resigned, to take effect May 1, 1903. Arthur L. Sullivan, assistant chemist of the station, has resigned to accept an appointment as analytical chemist in the Office of Internal Revenue of the United States Treasury Department.

Cornell University.—L. H. Bailey, professor of horticulture, has been appointed director of the college of agriculture and dean of the faculty of agriculture, to succeed I. P. Roberts upon his retirement.

North Dakota Station.—The legislature has made an appropriation of $5,000 for a substation to be established at Edgeley.

Ohio Station.—The station has established two additional test farms, one located at Germantown, in the tobacco district of southwestern Ohio, and to have the study of tobacco problems as part of its work; the other located at Carpenter, Meigs County, in the hill region of southeastern Ohio, and to be devoted to the special study of the problems peculiar to that region. The sandy land test farm in northwestern Ohio has been abandoned for the present.

Oklahoma College and Station.—The governor has reappointed all the members of the board of regents, and their nominations have been confirmed by the council. The Territorial legislature has made some alterations in the funds for the maintenance of the college which will result in increasing the total revenue of the college to the extent of about 5 per cent. An appropriation of $2,500 was made to the station to cover the cost of the manufacture and free distribution of blackleg vaccine.

Oregon Station.—E. F. Pernot, bacteriologist, has obtained encouraging results in curing cheese in sealed cans with the aid of pure cultures. Experiments in controlling the flavor of cheese have been in progress at the station for two years past. By the new method, the fresh curd containing the pure cultures is placed in tin cans, pressed overnight in a cheese press, and the covers then soldered on. The ripening process is said to result in a cheese of superior and quite uniform flavor, and of a more friable and waxy texture than ordinary cheese, without rind or danger of mold.

Pennsylvania College.—In order to make the new library building more fully adequate to the needs of the college, Andrew Carnegie has increased his donation for that purpose from $100,000 to $150,000. The designs for the new library will be completed soon, and it is expected that the work of construction will be begun by May 1.

Porto Rico Station.—The insular legislature has appropriated $5,700 for the station, $2,000 of which is for tobacco experiments, $1,000 for experiments with coffee, and $2,700 for permanent improvements on the farm, such as fencing, underdraining, irrigation ditches, etc.

Texas College and Station.—The following changes have been made in the governing board: K. K. Leggett, of Abilene; George T. Jester, of Corsicana; W. J. Clay, of Austin; A. Haidusheck, of Lagrange, and L. D. Amsley, of Hempstead, have been appointed, vice A. C. Oliver, Wm. Malone, A. P. Smyth, John W. Kokernot, and Jeff Johnson, retired. The new chemical-veterinary building recently completed is now occupied by the departments of chemistry and veterinary medicine. The large lecture room in this building has been used the past winter for holding a course of lectures by leading agriculturists and horticulturists, including a number from outside the State. E. P. Stiles, superintendent of the Troupe Substation, resigned

March 1. Instructor E. C. Green, of the horticultural department of the college, has been placed in charge of the station work temporarily.

Wyoming University and Station.—The last legislature passed a pure-food bill, making the chemist of the station State chemist. The laboratories of the university were designated State laboratories to carry on this work, and an appropriation of $1,000 per year was made to provide an assistant who will do the analytical work. It is expected that the station will be somewhat benefited in that the chemist will be aided in certain investigations of value to the station. The legislature also appropriated $15,000 to build an armory and gymnasium.

U. S. Department of Agriculture.—F. H. Hitchcock, chief of the Division of Foreign Markets, has resigned to become chief clerk in the new Department of Commerce and Labor.

E. E. Ewell, assistant chief of the Bureau of Chemistry, has left the Department to have charge of the Atlanta office of the German Kali Works.

Filibert Roth, of the Bureau of Forestry, has been appointed professor of forestry in the University of Michigan.

Frank Bond, for two years past connected with the irrigation investigations of this Office, has resigned to accept the position of Chief of the Drafting Division of the General Land Office.

Harry Hayward, professor of animal industry and dairying in the New Hampshire Agricultural College, has been appointed assistant chief of the Dairy Division, and E. H. Webster, professor of dairying in the Kansas Agricultural College, has been appointed inspector and expert.

James L. Farmer, of Tennessee, has been appointed chief special agent for the college and station exhibit at St. Louis, and is temporarily located in the Office of Experiment Stations.

A. L. Quaintance, entomologist of the Maryland Agricultural College and Experiment Station, has resigned to accept a position in the Division of Entomology. He will have charge of the investigations on the cotton-boll weevil this season.

Assignment of Soil Survey Parties, 1903.—The localities in which the soil survey will be carried on the present season by the Bureau of Soils is shown by the following table, the places named being the headquarters of the parties:

Soil survey, 1903.

Party in charge of—	April 1 to July 1.	July 1 to October 1.	October 1 to January 1.
Frank Bennett	Brookings, S. Dak	Parsons, Kans	Russell, Kans.
F. E. Bonsteel	Worcester County, Md	Sussex County, Del	Sussex County, Del.
J. A. Bonsteel	Long Island, N. Y	Long Island, N. Y	Long Island, N. Y.
R. T. A. Burke	Scott County, Ky	Mason County, Ky	Shelby County, Mo.
T. A. Caine	Fargo, N. Dak	Fargo, N. Dak	Lamar County, Tex.
G. N. Coffey	Sangamon County, Ill	Johnson and Knox counties, Ill.	Winnebago and Ford counties, Ill.
E. O. Fippin	Connecticut Valley	Connecticut Valley	Harpers Ferry, W. Va.
W. E. Hearn	Nacogdoches, Tex	Grand Island, Nebr	Norfolk, Nebr.
J. G. Holmes	San Luis Valley, Colo	San Luis Valley, Colo	Needles area, California.
C. A. Jensen	Salem, Oreg	Baker City, Oreg	Do.
J. E. Lapham	Norfolk, Va	Asheville, N. C	Asheville, N. C.
M. H. Lapham	Santa Clara, Cal	Sacramento, Cal	Sacramento, Cal.
A. W. Mangum	Pickens, S. C	Saluda, S. C	Orangeburg County, S.C.
H. W. Marean	Storey County, Iowa	Cerro Gordo County, Iowa	Marshall County, Ala.
J. O. Martin	Clinton County, Pa	Ashtabula County, Ohio	Miller County, Ark.
L. Mesmer	Blackfoot, Idaho	Laramie, Wyo	Needles area, California.
T. D. Rice	Audubon Park, La	Baton Rouge, La	Southern Louisiana.
A. M. Sanchez	Utah County, Utah	Milk River, Montana	Needles area, California.
W. G. Smith	Veroqua area, Wisconsin	Davidson County, Tenn	Lauderdale County, Ala.
H. J. Wilder	Lyon County, Minn	Oakland County, Mich	Pikeville, Tenn.

The headquarters for the tobacco work will be at Nacogdoches, Woodville, and Lufkin, Tex.; Marion, Perry County, Ala.; Hartsville, Darlington County, S. C.; Germantown, Ohio, and Hartford, Conn.

STATISTICS OF THE AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.—The statistics of these institutions for the past year have recently been compiled and are now in press as a bulletin of this Office. The summary shows that there are 66 colleges of agriculture and mechanic arts, 63 of which maintain courses of instruction in agriculture. The aggregate value of the permanent funds and equipment of the land-grant colleges and universities in 1902 is estimated to be $67,544,888.25, of which the land-grant fund of 1862 furnishes $11,369,031.50. The total number of acres of land granted to the States under the act of 1862 was 10,110,852, of which 1,010,845 acres, valued at $4,315,546.06, remains unsold. The value of the farms, grounds, and buildings and equipment of these institutions is estimated at $34,426,291.15.

The income of these institutions in 1902, exclusive of the experiment station funds, was $9,166,272.82. Of this amount, $682,960.65 was derived from interest on the land grant of 1862, $72,098.63 from interest on other land grants, $1,200,000 from the United States appropriation under act of 1890, and $3,761,291.21 from State appropriations for current expenses, buildings, and other special purposes. The value of the additions to the permanent endowment and equipment of these institutions in 1902 is estimated at $3,413,202.96.

The faculties of the colleges of agriculture and mechanic arts numbered 2,229 persons, and in other departments 1,050, making a grand total of 3,279 persons in the faculties of the land-grant institutions. The students in 1902 were as follows: (1) By classes—preparatory, 8,272; collegiate classes, 17,212; short or special courses, 5,114; postgraduate, 483; other departments, 16,334; total, 46,699. (2) By courses—agriculture, 6,299; mechanical engineering, 4,702; civil engineering, 2,146; electrical engineering, 1,814; mining engineering, 935; chemical engineering, 499; architecture, 336; household economy, 2,706; veterinary science, 977; dairying, 1,372; military tactics, 12,996. The graduates in 1902 numbered 4,443, and since the organization of these institutions, 50,026. The average age of graduates in 1902 was 21 years and 11 months.

There are now 60 agricultural experiment stations, excluding the substations, and of these 55 receive appropriations provided for by act of Congress. In Connecticut, New Jersey, New York, Hawaii, Missouri, Alabama, and Louisiana separate stations are maintained wholly or in part by State funds.

The total income of the stations during 1902 was $1,328,847.37, of which $720,000 was received from the National Government, the remainder, $608,847.37, coming from the following sources: State governments, $369,771.12; individuals and communities, $2,301.38; fees for analyses, $80,942.36; sales of farm products, $105,644.60; miscellaneous, $50,187.91. In addition to this the Office of Experiment Stations had an appropriation of $139,000 for the past fiscal year, including $12,000 for the Alaska experiment stations, $12,000 for the Hawaiian investigations, $12,000 for the Porto Rico investigations, $20,000 for nutrition investigations, and $50,000 for irrigation investigations. The value of additions to the equipment of the stations in 1902 is estimated at $262,829.62.

The stations employ 710 persons in the work of administration and inquiry, not including the regular or temporary laborers. Of these 56 are directors or special agents in charge of stations, 151 chemists, 54 agriculturists, 7 agronomists, 25 animal husbandmen, 73 horticulturists, 50 botanists, 20 mycologists and bacteriologists, 56 entomologists and zoologists, 8 biologists, 34 dairymen, 27 veterinarians, 12 meteorologists, 5 physicists, 4 geologists, and 9 irrigation engineers. Three hundred and sixty-four station officers do more or less teaching in the colleges with which the stations are connected.

The activity and success of the stations in bringing the results of their work before the public continue unabated. During the year they published 373 annual reports and bulletins, which are many more than are required by the Hatch Act. These were supplied to over half a million addresses on the regular mailing lists. A larger number of stations than formerly supplemented their regular publications with more or less frequent issues of press bulletins, and most of the stations report a large and constantly increasing correspondence with farmers on a wide variety of topics.

ONTARIO AGRICULTURAL COLLEGE.—A short course in stock and grain judging for farmers' institute workers was held at the college this year for the first time. The course opened March 17, and continued for two weeks. It included judging exercises with horses, beef and dairy cattle, sheep, swine, and grain, including the identification of weed seeds found in grass seed and clover seed.

THE SCHOOL OF PRACTICAL AGRICULTURE AND HORTICULTURE AT POUGHKEEPSIE.—This school, recently removed from Briarcliff Manor, is to be closed on account of failure to secure the necessary funds for buildings and general equipment. The furnishings of the two leased buildings which it occupied and the stock and implements on the farm will be sold.

DOYLESTOWN FARM SCHOOL.—The trustees have decided to purchase a tract of land as an addition to the farm, at a cost of $5,000. The Pennsylvania legislature has appropriated $15,000 toward the maintenance of the school.

WINONA AGRICULTURAL AND TECHNICAL INSTITUTE.—This is a secondary school for boys, opened last September at Winona Lake, Ind., and is located on the grounds of the Winona Assembly and Summer School. The course of study embraces six years of work, two in the preparatory department and four in the academic. The subjects having an agricultural bearing are soils and crops, farm buildings, breeds of live stock, history of agriculture, dairying, agricultural engineering, feeds and feeding, entomology, economic botany, horticulture, agricultural physics, and chemistry. In addition to these subjects, instruction is given in literature, mathematics, history, science, manual training, language, the Bible, vocal music, and physical culture. The enrollment this year is nearly 90, and includes boys from 11 different States and 3 foreign countries. A memorial to be known as the James A. Mount Building will be ready for occupancy in the fall.

NEW PERIODICALS.—The Pasteur Institute of Paris has recently issued a new publication entitled *Bulletin de l'Institut Pasteur*. The first number bears the date February 28, 1903, and the publication is to be issued bimonthly. The purpose of this Bulletin is to furnish to persons who are interested in micro-biology in its broadest sense reviews and abstracts of current literature in this field. The material contained in the *Bulletin* is divided into 2 classes, viz, reviews and abstracts. The reviews deal in a critical manner with subjects of general interest, and are intended for the use of persons who are not experts in micro-biology or actually occupied in investigations in this field. The abstracts will be made to cover all publications on bacteriology, medicine, general biology, physiology, and biological chemistry, in so far as these may be connected with the subject of micro-biology. The abstracts are classified into 8 groups according to the subjects involved, as follows: General works, text-books, micro-biology, technique, instruments, cultures, staining; morphology and classification of microbes; works on general biology as related to micro-biology; chemical actions exercised by microbes, agricultural and industrial micro-biology; pathogenic effects of microbes, etiology of diseases, experimental infections, reactions of the organism; microbic and cellular toxins, cytotoxins, diastases; phagocytoses, immunity, vaccination, serotherapy; and hygiene, prophylaxis, disinfection.

Naturwissenschaftliche Zeitschrift für Land- und Forstwirtschaft (Natural Science Journal for Agriculture and Forestry) is the title of a new periodical which appeared early in the year. It is a monthly journal, edited by Prof. Carl Freiherr von Tubeuf and Dr. Lorenz Hiltner, both of Munich, who have associated with themselves as collaborators a long list of specialists prominent in various branches of agriculture and forestry. The scope of the new journal will embrace the anatomy, physiology, and biology of agricultural plants and forest growths, the chemistry and physics of the soil, meteorology, and injurious diseases and insects. Both original articles and abstracts will be published, together with notes and personal items.

The Royal Bavarian Agricultural-Botanical Institute, which was opened at Munich last October, with Dr. L. Hiltner as director, has begun the publication of an organ known as *Praktische Blätter für Pflanzenbau und Pflanzenschutz.* Judging from the announcement and the first number, it is to be a sort of popular bulletin, issued monthly and confined to brief accounts of matters of direct interest to the practical farmer. As the popular organ of a German scientific institution and edited by the director, it is of interest as marking a rather unusual departure.

MISCELLANEOUS.—A note in *Science* states that the Government of Nicaragua will send 15 students annually to colleges of agriculture in the Southern States.

An experiment farm of 50 acres near Comanche, Tex., is reported to have been established by the "Frisco System," with the object of assisting the farmers of the region in raising hogs, interest in which has been increased by the establishment of a packing house at Fort Worth.

As previously announced (p. 532) the Carnegie Institution has made a grant of $8,000 for the establishment and maintenance of a desert botanical laboratory. Acting on the recommendation of the committee appointed to look after the location and management of the laboratory, F. V. Coville and D. T. MacDougal, the regents have decided to locate the laboratory on a tract of about 50 acres of land near Tucson, Ariz. A laboratory building will be erected there at an early date.

The Sharon Biological Observatory, a summer school for teachers at Sharon, Mass., will, according to *Science*, experiment in forestry on a tract of 300 acres of woodland which it purposes making into a model forest. Applications have been made to the Bureau of Forestry for a working plan.

G. M. Odlum, a graduate of the Michigan Agricultural College in 1900, now farm manager of the Methodist Episcopal Estate, Umtali, Rhodesia, is in this country to study the farm machinery in use on large ranches in our Western States, with a view of purchasing and exporting suitable steam-power plows and other implements for use on the estate in his charge. This estate contains about 13,000 acres, and, while not officially connected with the agricultural department of Rhodesia, a small area is being used by Mr. Odlum for demonstration experiments with cereals, legumes, forest trees, and in irrigation, under the auspices of that department.

The department of agriculture of Rhodesia, located at Salisbury, has until this year been a division of the surveyor-general's department, but is now an independent organization consisting of the secretary of agriculture, E. Ross Townsend, an agriculturist, a register of brands, a staff of clerks, and the veterinary service, which includes a chief veterinary surgeon and five assistant surgeons. The department cooperates with farmers in experiments with cotton and tobacco, maintains a free veterinary service, and publishes bulletins for distribution among the farmers. Mr. Odlum will spend considerable time studying the work of the U. S. Department of Agriculture, more especially with reference to the tobacco investigations, for the purpose of making a comprehensive report to the department of agriculture of Rhodesia.

O

EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*

EDITORIAL DEPARTMENTS.

Chemistry, Dairy Farming, and Dairying—The Editor and H. W. Lawson.
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Botany and Diseases of Plants—Walter H. Evans, Ph. D.
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Field Crops—J. I. Schulte.
Entomology and Veterinary Science—E. V. Wilcox, Ph. D.
Horticulture—C. B. Smith.
With the cooperation of the scientific divisions of the Department.

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EXPERIMENT STATION RECORD.

Vol. XIV. May, 1903. No. 9.

Perhaps no line of research with farm animals promises more important returns to station workers than digestion experiments and other studies with horses. This is brought out by a recent compilation of investigations on horse feeding, by Dr. C. F. Langworthy, of this Office, which summarizes late work on the subject, and especially such as has been done by the American stations. It is evident from this that while there is an abundance of data regarding the composition of the comparatively small number of feeding stuffs ordinarily given to horses, the data regarding the digestibility of the different materials is quite limited, both in respect to the number of feeding stuffs studied and the number of experiments with any given feed. For instance, record was found of only about thirty-six tests with oats, thirty with meadow hay, and twelve with alfalfa, feeding stuffs which have apparently been most often selected for studies of digestibility. These numbers do not include numerous experiments in which these materials form part of a mixed ration and no attempt was made to determine the digestibility of single materials.

It appears that the work of the stations in the United States along these lines is limited to a single series which was carried on at the Maryland Station. Further experiments are much needed with such common feeding stuffs as green grasses and clover, timothy, clover, and other hays, corn silage, wheat, barley, wheat bran, wheat shorts, dried brewers' grains, gluten meal, linseed meal, etc. The digestibility of some of these has apparently never been studied with horses, while in other cases more figures are needed in order that satisfactory average values may be available.

Additional feeding experiments under different conditions could also be made with profit to supply accurate data regarding the comparative economy of various feeding stuffs and rations, their wholesomeness and effectiveness when fed for long periods, and related topics. It is a common practice to feed horses an abundant ration before they are sold in order that they may reach market in good condition. So far as can be learned practically no studies have been made of the value of different rations for this purpose, the length of time the feeding should be continued, and the comparative cost of the gains made.

In the compilation referred to data are summarized showing the amounts fed to their horses by fire companies, express companies, packing houses, and others employing large numbers of animals, as well as the rations fed to farm horses at the experiment stations. On an average the ration of the American draft horses at light labor was found to supply, per thousand pounds live weight, approximately one pound of digestible protein and fifteen thousand calories of energy. Similar values for horses at moderate work are one and one-half pounds of digestible protein and twenty-three thousand calories. These values are considerably lower than those called for by the Wolff-Lehmann feeding standards. It is interesting to note that, basing his deduction on data of an entirely different character, Zuntz has pointed out that the Wolff standards are too high. Other investigators have reached the same conclusion. The subject is certainly worth the attention of American investigators, as the importance of devising suitable feeding standards for horses can hardly be overestimated.

So far both American and foreign experiments with horses, generally speaking, have been limited to draft animals and army horses. The food requirements of hunters, driving and carriage horses, and other fancy classes is practically an unworked field so far as experimental investigations are concerned.

The Library of Congress has commenced the printing of a series of cards which will be helpful to those in charge of agricultural libraries and to the users of such libraries in general. This series of cards is devoted to the accessions which are being constantly made to the Library of this Department. These are uniform in size with the catalogue cards now so generally used by libraries, and contain the name of the author and title of the book, and a quite full description, the contents frequently being noted. They are available for purchase by libraries and individuals, for incorporation in card catalogues, or for record purposes. All or only a portion of the cards of this series may be ordered, and as many copies of each title as are desired, to suit the purpose for which they are used.

Each card bears the imprint of the Department Library, and serial numbers are given which correspond with the numbers in the Accessions to the Department Library, issued quarterly. This furnishes a convenient means of selecting and ordering the cards, which are distributed by the Library of Congress. The charge is two cents each for single copies, and one-half cent each for additional copies or duplicates. Although every card need not be purchased unless desired, lists should be made up in the serial order of the cards, for convenience in filling the order, and where this is not done a slight additional charge is made.

It will thus be seen that the convenience and purpose of the user has been considered in allowing a selection of cards along any given subject or class of publications, and in providing duplicates at slight cost for cross-reference or other purposes. Up to the present time about eight hundred titles have been printed.

The value of these cards and the use which may be made of them will be quite evident. The Department of Agriculture is expending through its Library about seven thousand dollars a year in the purchase of books. These are for the most part on subjects relating quite directly to agriculture and agricultural science, and include all the new books of value which come to the notice of the Librarian and the large corps of Department workers in various lines, as well as many old and rare works. The Department Library is fast becoming an unusually complete repository of historical and new literature on agriculture and the sciences relating to it, and its lists of accessions have a special value to persons interested in that field.

The printing of these cards will be a convenience to libraries, as they may be incorporated in any card catalogue and thus save the labor of cataloguing a book which the library has, or show where it may be found. They contain much more information than the ordinary library card, and are less expensive. In time they will naturally form quite extensive bibliographies on a variety of subjects, and thus enhance the value of the small library for reference purposes. For the agricultural colleges and experiment stations they have a special value, and will be an increasingly useful contribution.

The Department Library is now engaged in preparing a card catalogue of the contents of scientific periodicals, and will begin printing this soon. A selected list of the more important journals has been made, and these will be catalogued in order, beginning in each case with the first volume of the journal. Cards will be made not only for the title of each article, but for each important subdivision of the article, making the catalogue quite detailed and enabling intelligent classification of the cards.

This undertaking is in line with the suggestion of the Committee on Indexing Agricultural Literature, which has been working in this direction for several years past. It will be of the greatest assistance in looking up literature upon any subject, and will be available to all college and station men, as sets will be distributed gratis to the college and station libraries. As the sets of periodicals included in the catalogue are all on the shelves of the Department Library, and as these books are now loaned out to college and station men under certain restrictions, this catalogue of periodical literature will help to relieve the difficulties of workers at institutions where library facilities are meagre.

The National Institute of Agriculture at Paris has recently issued an illustrated volume of nearly six hundred pages giving a historical account of this institute, especially during the period from 1876 to 1901, and a description of its present organization and work.[a] The institute was established at Versailles in 1848, but was suppressed in 1852 and was reestablished in Paris August 9, 1876. The founder of the institution was Eugène Tisserand. The volume contains lists of the various men who have held professorial chairs in the institution, and also its present organization, together with bibliographical lists of the works published by the various professors. M. Tisserand was director from 1876 to 1879, M. Risler from 1879 to 1900, and the present incumbent is Paul Regnard.

The instruction given at the institute is both theoretical and practical, and is intended to turn out expert agriculturists, with the necessary practical and scientific knowledge for managing farms and estates, becoming administrative officers in the agricultural work of the government, instructors in special lines, directors and investigators in experiment stations, agricultural engineers, and similar callings where expert knowledge is required.

Although primarily an institution for instruction, a number of special experiment stations have been established in connection with the institute, as departments of it or under its general supervision. Among these are the Station for Seed Testing, established in 1884, now under the direction of E. Schribaux; the Station for Testing Agricultural Implements, established in 1887, of which M. Ringelmann is director; the Laboratory of Fermentations, established in 1888, under E. Duclaux; the Station for Vegetable Pathology, established in 1888, under the direction of M. Delacroix; the Entomological Station, established in 1894, now in charge of M. Brocchi; the Viticultural and Enological Laboratory, under the direction of M. Viala; and the Experiment Station for Agricultural Hydraulics, with M. Hérisson at its head. These various laboratories receive third-year students who serve to some extent as assistants in the laboratory work.

This memoir of the National Institute of Agriculture, which is the capstone of agricultural education in France and one of the foremost institutions of its kind in the world, contains much which is of interest and of permanent value to the student of agricultural education and investigation.

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[a] L'Institut National Agronomique de 1876 à 1901.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

On the colorimetric determination of small quantities of phosphoric acid and silica, F. P. Veitch (*Jour. Amer. Chem. Soc., 25 (1903), No. 2, pp. 169–184*).—This article reports a study of the conditions affecting the accuracy of the Lepiere[a] colorimetric method for phosphoric acid as worked out in detail by Woodman and Cayvan (E. S. R., 13, p. 319), viz, the influence of turbidity, organic matter, ammonium and iron salts, dissolved silica, etc., and means of overcoming the errors thus introduced. The method proposed by the author for the determination of phosphoric acid and silica in the same soil solution is as follows:

"The water or extract is tested for iron by adding potassium ferrocyanid to the acidified solution. The absence of interfering amounts of iron having been shown, a measured volume of the water or soil extract is freed from suspended matter by filtration or by passing through a Chamberland filter (reject the first 100 cc. that passes) or by evaporating to dryness and filtration, or in some cases where the water is but slightly turbid the turbidity or color is corrected for by determining its amount in terms of the standard, the reading thus obtained being afterwards subtracted from the final readings. Add to the clear extract 5 cc. of nitric acid (sp. gr. 1.07) and 4 cc. of molybdate solution. Place in the camera, allow 10 to 30 minutes for development of color, and compare with a standard phosphate solution, which may conveniently contain 10 parts per million of phosphorus pentoxid and be contained in a sliding tube connected by rubber tubing with a side neck tube graduated in cubic centimeters within the camera. (The color of the standard is not affected by the rubber tube during one working day, but the standard should be made fresh each day.) The readings thus obtained (several should be made and the average taken) minus the reading for turbidity, when calculated to a volume of 100 cc., equals $P_2O_5+SiO_2$ in parts per million of solution.

"Another measured portion of the water or extract is evaporated to dryness twice with a filtration between the evaporations in a porcelain or platinum dish with 3 cc. nitric acid (sp. gr. 1.07) plus a little magnesium nitrate,[a] heated 2 hours in a water oven, 5 cc. nitric acid (sp. gr. 1.07) added, filtered, washed to about 45 cc., placed in a camera, and compared. If colored, the reading is noted and is finally subtracted from the total reading. Add 4 cc. of ammonium molybdate and thoroughly mix. Place in the camera and compare after 2 to 5 minutes. The corrected reading calculated to volume of 100 cc. is P_2O_5 in parts per million of solution. This reading subtracted from the $SiO_2+P_2O_5$ reading and the difference multiplied by 0.55 gives the silica.

"Where the original solution is too much colored with organic matter to be accurately corrected for by reading the color thus produced against the standard phosphate solution, it is necessary to evaporate with about 0.1 gm. magnesium nitrate[b] and burn off the organic matter, take up with water +3 nitric acid, evaporate to dryness, and heat 2 hours in the water oven. Add 5 cc. nitric acid and proceed as above. Readings $=P_2O_5$. In this case silica is not determined."[a]

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[a] Bul. Soc. Chim. Paris, 15 (1896), p. 1213.

[b] "In solutions containing sufficient base to form normal phosphates with all the phosphoric acid, the addition of magnesium nitrate appears to be unnecessary."

Various precautions to be observed are noted and results of tests of the method are reported which show that "there is a maximum error of ±2 scale divisions (each scale division =1 cc.) in the reading. When the soil solution is made by treating 1 part of soil with 5 parts of water and 50 cc. are taken for the determination, the error on the dry soil is ±2 parts per million cc.; when 100 cc. are taken for the determination, the error is ±1 part per million, so that the working errors may only be neglected when at least 200 cc. of solution are taken for the determination."

Determination of citric-soluble phosphoric acid in Thomas slag by the molybdate method, H. Neubauer (*Ztschr. Angew. Chem., 15 (1902), No. 44, pp. 1133–1135; abs. in Analyst, 28 (1903), No. 323, p. 50*).—The author recommends a molybdic solution containing in 2 liters 150 gm. of ammonium molybdate and 1 liter of nitric acid (1.2 sp. gr.), since it is claimed that such a solution does not precipitate silicic acid from the citric-acid solution of the slag. Moreover, the precipitation with this solution is complete after 15 minutes' heating at 80° C. and 30 minutes' standing, and the precipitate is dense and easily washed.

Determination of phosphoric acid in Thomas slag, O. Kellner and O. Böttcher (*Chem. Ztg., 26 (1902), No. 97, p. 1151; abs. in Analyst, 28 (1903), No. 323, p. 50*).—If a precipitate which is not entirely soluble in hydrochloric acid is formed by adding to the Wagner extract of the slag an equal volume of a reagent made by dissolving 1,100 gm. of citric acid in water, adding 4,000 gm. of 24 per cent ammonia and diluting to 10 liters, boiling for 1 minute, and allowing to stand 5 to 10 minutes, the silica of the slag should be removed, before the phosphoric acid is precipitated with magnesia mixture, by the Böttcher method (E. S. R., 9, p. 520).

Chemical analysis of soils, R. Corradi (*Bol. Chim. Farm., 41 (1902), pp. 419–424, 675–678; abs. in Chem. Centbl., 1902, II, No. 21, p. 1340*).—This article discusses methods of sampling and chemical and physical analysis. The calcium carbonate content of the soils is calculated from the loss of weight on treatment of the soil with hydrochloric acid in a special apparatus which is described. Total phosphoric acid is determined in nitric acid solution of the soil by multiplying the weight of ammonium phosphomolybdate precipitate by 0.0355. In certain cases the phosphoric acid, magnesia, potash, and soda combined with humus are determined. The direct precipitation method of Corenwinder and Contamine is used for potash.

A chemical method for determining the quality of limestones, A. M. Peter (*Jour. Amer. Chem. Soc., 25 (1903), No. 2, pp. 143–150*).—Proceeding on the theory that the rapidity of disintegration of limestones depends upon the proportion of oxidizable material—ferrous phosphate, organic matter, etc.—the author proposes to measure the quality of limestones for building and road-making purposes by dissolving "the limestone in dilute sulphuric acid in the presence of a known amount of potassium permanganate and determining how much permanganate has been reduced during that process, after which the solution is to be used for the determination of phosphoric acid by a rapid volumetric method, and the insoluble residue for the determination of the insoluble matter and clay." The details of the method are explained, and the results of its use in the examination of a number of samples are reported. "The conclusion would seem justified that the limestone which consumes much more than 0.3 per cent of oxygen and at the same time contains as much as 1 per cent of phosphoric acid, more especially if it contains also several per cent of clay, will disintegrate rapidly upon exposure to air and moisture and will be undesirable for road building or other exposed construction."

The determination of atmospheric carbon dioxid by the Walker method, A. G. Woodman (*Jour. Amer. Chem. Soc., 25 (1903), No. 2, pp. 150–161, figs. 2*).—

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[a] "Or the organic matter may be destroyed by treating with aqua regia in the presence of sufficient base to prevent loss of phosphoric acid."

This method[a] is briefly outlined as follows: "To a definite volume of air, usually 1 to 2 liters, is added a measured amount of standard barium hydroxid, care being taken to avoid contact of the solution with the air. After the absorption of the carbon dioxid the solution is filtered under reduced pressure through asbestos and the clear barium hydroxid received into a known excess of standard hydrochloric acid. The absorption vessel is rinsed out with water free from carbon dioxid. The excess of acid is then determined by titration with barium hydroxid." Reagents and apparatus required for carrying out the method are described in detail and numerous tests of its accuracy are reported. "The results obtained confirm Walker's statement that the method is accurate under ordinary circumstances to 0.1 part in 10,000. . . . With a little practice the method was found to be rapid and easy of execution and preferable to the Pettenkofer method."

The oxidation of organic nitrogen compounds and the estimation of the carbon and nitrogen therein by the moist process, E. VAN AKEN (*Proc. Sec. Sci., Koninkl. Akad. Wetensch. Amsterdam, 4 (1901–2), pp. 91–95*). Tests are reported which show that Fritsch's method[b] gives too low results in case of certain amids and urea derivatives. This appears to be due largely to the relative proximity of the nitrogen atoms in the compounds. The use of an oxidizing agent like chromic acid in the Kjeldahl process does not obviate the difficulty.

Report on the determination of constants for use in the preparation of hydrographic tables, M. KNUDSEN ET AL. (*K. Danske Vidensk. Selsk. Skr., 6. ser., 12 (1902), No. 1, pp. 15, figs. 18*).—This includes papers on the collection and preparation of water samples, the determination of specific gravity, determination of chlorin and salt, and expansion of sea water.

On the impurities in compressed oxygen and their rôle in combustion in the bomb calorimeter, M. BERTHELOT (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 20, pp. 821–824*).—The author finds that in the amount of compressed oxygen used for carrying out a combustion with the bomb calorimeter no carbon dioxid or at least only a negligible quantity is contained. However, the oxygen was found to contain 0.0005 gm. hydrogen, which would by oxidation produce a small quantity of heat. He believes, therefore, that the quantity of hydrogen mixed with the oxygen should be determined.

The nature, determination, and distribution of the pentosans in the Sea Island cotton, F. S. SHIVER (*South Carolina Sta. Bul. 78, pp. 38*).—The literature of pentosans and their determination is reviewed at considerable length, the phenylhydrazin and phloroglucin methods of analysis as used by the author are given, and determinations by both methods of the pentosan content of Sea Island cotton and its parts are reported. The finest and coarsest varieties of cotton of the crops of 1896 and 1898 were used. The following table summarizes the main part of the data:

Pentosans in Sea Island cotton.

Parts.	Percentages of parts.		Pentosans by phenylhydrazin method.				Pentosans by phloroglucin method.			
			Crop 1896.		Crop 1898.		Crop 1896.		Crop 1898.	
	Finest variety.	Coarsest variety.	Finest variety.	Coarsest variety.	Finest variety.	Coarsest variety.	Finest variety.	Coarsest variety.	Finest variety.	Coarsest variety.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Lint	4.05	6.55	1.25	1.45	......	......	1.67	1.66	2.17	1.71
Seed	10.27	13.47	13.51	12.55	14.44	13.38	12.27	11.83	14.15	13.23
Kernels	......	......	4.62	4.66	4.67	......	4.02	4.54	4.71	4.27
Hulls	......	......	22.61	23.83	20.44	20.77	22.98	23.96	20.18	20.26
Bolls	12.55	12.56	11.33	12.14	......	12.33	11.63	12.90	11.17	11.81
Leaves	23.03	14.39	......	6.73	6.64	......	10.34	7.14	7.05	7.16
Stems	37.13	39.04	15.40	15.12	16.96	......	16.17	16.60	16.76	16.63
Roots	12.97	13.99	14.74	14.35	16.86	......	15.49	15.35	16.63	15.75
Whole plant	......	......	......	......	13.97	......	......	......	13.52	13.14

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[a] Jour. Chem. Soc. [London], 77 (1900), p. 1110.

[b] Liebig's Ann. Chem., 294 (1897), p. 79.

The average pentosan content of Sea Island cotton-seed meal of the crops of 1897 and 1898 determined by both methods was 12.92 per cent. "From this work we see that the pentosans are widely distributed in the Sea Island cotton plant and all its parts and products. The average amount present varies from 1.53 per cent in the lint up to 21.88 per cent in the hulls. From their wide distribution it is highly important that the pentosans should always be determined in all proximate analyses." The work of others is summarized to show that these bodies apparently have a slightly less food value and lower digestibility than the other well-known and commonly occurring constituents of the nitrogen-free extract. "In conclusion, it appears from the close relation existing between the pentosan and crude-fiber content that the true function of the pentosans in the plant economy is the formation of the cell membrane, as Stoklasa [E. S. R., 11, p. 121] has already observed."

Solutions for testing cream and milk, J. B. WEEMS and C. E. GRAY (*Iowa Sta. Bul. 67, pp. 266–272*).—Standard solutions for testing milk and cream, prepared from commercial alkaline tablets, according to the directions accompanying them, were found to have strengths from 12.4 to 14.8 per cent greater than a tenth-normal solution. Exposure of the tablets for about 6 months reduced these figures nearly 10 per cent. Solutions repeatedly frozen and completely thawed did not change in strength. The use of the liquid portion of a partly frozen solution was found to give inaccurate results. Exposure of a standard solution in an open vessel reduced its strength one-third in 5 days. Limewater prepared from either pure or common lime at 66° F. had a strength equal to 0.45 per cent of a tenth-normal solution. Suggestions are given as to the use of standard solutions, the preparation of tenth-normal from normal solutions, and the preparation of a solution of phenolphthalein for use as an indicator.

On the determination of moisture in honey, F. T. SHUTT and A. T. CHARRON (*Trans. Roy. Soc. Canada, 2. ser., 8 (1902–3), III, pp. 35–46, pl. 1*).—Several methods of determining moisture in honey were compared, with conclusions substantially as follows: "In drying a solution of honey in glass tubes on asbestos, a temperature of 98° C. at atmospheric pressure induces a considerable and continuous dehydration of the levulose, resulting in an apparent loss of moisture far exceeding the real amount present. Drying in glass tubes on asbestos at atmospheric pressure between 70 and 75° also occasions a decomposition of the levulose of the honey. . . . Drying in platinum dishes on sand in a partial vacuum (8 in.) at a temperature of 60 to 70° for 24 to 48 hours, yields results in close accord with those calculated from the specific gravity determinations. A more prolonged drying is undesirable, as such appears to induce a slight decomposition of the levulose. Drying on asbestos yields much higher results than drying on sand. This, apparently, is as true at 60° as at 70°, and indicates a peculiar property or quality of the asbestos in inducing decomposition of the levulose. There were no differences of note between the results from drying in round and flat bottom platinum dishes." Similar determinations were made on solutions of levulose and dextrose, the results agreeing very well on the whole with those obtained on solutions of honey.

Some notes concerning Halphen's test for cotton-seed oil, E. FULMER (*Jour. Amer. Chem. Soc., 24 (1902), No. 12, pp. 1148–1155*).—The reaction was found to be greatly diminished in intensity by heating the oil to 220 to 240° C. and negative in oil heated to 260 to 270° C. Lard from pigs fed cotton-seed meal showed an intensity of coloration by this test equivalent to several per cent of cotton-seed oil.

Iodin absorption of oils and fats, L. M. TOLMAN and L. S. MUNSON (*Jour. Amer. Chem. Soc., 25 (1903), No. 3, pp. 244–251*).—Previously noted (E. S. R., 14, p. 523).

Does cholesterol occur in maize oil? A. H. GILL and C. G. TUFTS (*Jour. Amer. Chem. Soc., 25 (1903), No. 3, pp. 251–254*).—Previously noted (E. S. R., 14, p. 523).

Determination of stearic acid, H. Kreis and A. Hafner (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 1, pp. 22–27*).

Examination and composition of lemon juice, K. Farnsteiner (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 1, pp. 1–22*).—Methods of analysis are given and discussed and analytical data reported.

The identification and composition of malt liquors, C. L. Parsons (*Jour. Amer. Chem. Soc., 24 (1902), No. 12, pp. 1170–1178*).—The results of analyses of 76 samples of American malt liquors as compared with analyses published some years ago by the Division of Chemistry of this Department indicated a more general use of glucose in their manufacture. About 50 per cent of the samples contained salicylic acid. The author discusses the analytical data reported as regards the probable use of malt in the production of the liquors sampled. Methods of analysis are given.

The standardization of sulphuric acid, F. S. Shiver (*South Carolina Sta. Bul. 77, pp. 7*).—Comparative tests of the barium chlorid and ammonium sulphate methods for the standardization of sulphuric acid showed very close agreement between the two methods. The ammonium sulphate method is considered fully as accurate and far more simple and rapid than the barium chlorid method. The author also compared with the barium chlorid method, which was taken as a standard of accuracy in the work, the two indirect methods proposed by S. P. L. Sorensen, which are based upon the use of sodium oxalate and sodium bicarbonate, respectively. Both these methods gave lower results.

Analysis of tanning materials, W. H. Teas (*Jour. Soc. Chem. Ind., 22 (1903), No. 3, pp. 128–130*).—This was presented at the last convention of the Association of Official Agricultural Chemists (E. S. R., 14, p. 113).

Liquid baths for melting point determinations, H. Scudder (*Jour. Amer. Chem. Soc., 25 (1903), No. 2, pp. 161–163*).—For temperatures below 325° C., a mixture prepared by boiling together for 5 minutes 7 parts by weight of sulphuric acid (sp. gr. 1.84) and 3 parts by weight of potassium sulphate is considered suitable, and for temperatures from 360 to 600° a fused zinc chlorid bath has been found the most satisfactory. The boiling point of the sulphuric acid and potassium sulphate mixture may be increased to 365° by taking 6 parts by weight of the acid and 4 parts of the sulphate.

The prevention of bumping, H. Scudder (*Jour. Amer. Chem. Soc., 25 (1903), No. 2, pp. 163–165*).—Directions are given for the use of a single glass capillary tube for this purpose, the method being considered simple and effective for ordinary laboratory work.

A water jacket of constant ordinary temperature, J. C. Schalkwijk (*Proc. Sec. Sci., Koninkl. Akad. Wetensch. Amsterdam, 4 (1901–2), pp. 29–35, pl. 1*).

A new form of Kjeldahl apparatus (*Apoth. Ztg., 17 (1902), p. 817; abs. in Chem. Centbl., 1903, I, No. 3, p. 194*).

Report of the senior analyst for the year 1901, C. F. Juritz (*Rpt. Senior Analyst, Cape Good Hope, 1901, pp. 61, map 1, dgm. 1*).—This is a report upon the 1,389 miscellaneous samples analyzed during the year. Of this number 634 samples were food products, of which 114 were found adulterated. The number of samples of soils analyzed was 63 and fertilizers 40. Numerous samples of sheep dips, disinfectants, and minerals were also examined.

Chemical division, B. C. Aston (*New Zealand Dept. Agr. Rpt. 1902, pp. 109–126*).—Analyses of 8 samples of butter, 12 of milk and cream, 55 of potable waters, 31 of fertilizing materials, 25 of soils, and numerous miscellaneous samples are reported, together with the results of examination of Babcock glassware. A preliminary note is made on a chemical study of the karaka nut (*Corynocarpus lævigata*). The kernel is known to be poisonous in its raw state, but suitably prepared, is used as a food. Prussic acid was obtained from the aqueous extract by distillation. A bitter crystalline substance, to which the name "karakin" is given, was obtained, the method of preparation and the properties of the compound being described.

Handbook of inorganic chemistry, O. DAMMER (*Handbuch der anorganischen Chemie. Stuttgart: Ferdinand Enke, 1903, vol. 4, pp. XXIV+1023*).—Abstracts of the literature of inorganic chemistry from 1892 to 1902.

Results of agricultural chemistry, A. MAYER (*Resultate der Agrikulturchemie. Heidelberg: Carl Winter, 1903, pp. VIII+269, figs. 28*).—This is a condensed summary of what the author considers the most important practical results of investigations in agricultural chemistry. It is based on the fifth revised edition of the author's larger treatise on agricultural chemistry, but is less technical in style and therefore better suited to the purposes of the general reader.

Agricultural chemistry, I. GIGLIOLI (*Chimica agraria, campestre, e silvano. Naples: Marghieri, 1902, pp. XVIII+877, figs. 31; rev. in Nature, 67 (1902), No. 1730, p. 169*).

Annual report of the progress in animal chemistry, R. ANDREASCH and K. SPIRO (*Jahresber. Thier. Chem., 31 (1901), pp. XXXVII+1054*).—This contains abstracts of the literature of animal chemistry for 1901, with subject and author indexes. The volume is prefaced with a brief biographical sketch of the late M. Nencki, one of the previous editors of this publication, and a list of the publications of Nencki and his pupils.

BOTANY.

Studies in the vegetation of the State. II. The relation of the water content of the soil to certain plants, principally Mesophytes, G. G. HEDGCOCK (*Univ. Nebraska, Bot. Survey Nebraska, 1902, VI, pp. 79; abs. in Bot. Centbl., 90 (1902), No. 25, pp. 695, 696*).—The results of experimental studies of the conditions influencing the growth of plants in different soils, the water content of the soils, and the relative amount of water in the plants are given, together with statements as to the influence of drought on plants. The amount of "physical" water in soils was found to vary directly with the water-retaining capacity of the soils. The chief known factors influencing the water content are gravity, capillarity, surface tension, and evaporation. The amount of physiological water in soils, i. e., that available for the use of plants, varies directly with the total amount of water held in the soil, and inversely with the amount of hygroscopic water. The adaptability and vigor of the plant varies according to its power to draw water from the soil. The amount of water in the soil which is not available for the use of the plant is dependent directly upon the ability of the plant to withdraw water from the soil. The soil composition and texture directly affect the ability of the plant to withdraw the water.

The percentage of water in the tissues of the plant is usually greatest in seedlings and decreases gradually as the plants grow older. Plants containing the highest percentage of water are not necessarily the healthiest, as frequently the most vigorous growing plants were found to contain a considerably lower percentage of water than less thrifty ones. Shade plants and plants grown under humid conditions have a relatively high water content, due probably to the poor development of the fibrovascular system.

Mesophytic plants apparently lose water when first wilting in about the same ratio by weight as the soils. This probably indicates that the plant gets little or no water from the soil after it begins to wilt excessively and that the root sytem is already beginning to die at the extremities. Xerophytic plants lose weight very slowly when subjected to drought and some retain most of the water in their tissues even when the substratum is practically air dry. The percentage of water in dying plants varies not only with the species but also with the individuals. Seedlings die with a greater percentage of water in their tissues than older plants, and mature plants when dying contain the minimum percentage of water.

The ability of plants to take water from the soils varies in an ascending scale from hydrophytes, through mesophytes, to xerophytes. In a general way, the limit of available water within the plant coincides with the physical conditions of its habitat.

Herbaceous plants, both annuals and perennials, when affected by slow drought usually die in the following manner: The older leaves of the plant perish first, the younger ones living to the last. The finer roots die first, then the coarser ones, finally the stem, and last of all the growing point of the stem, or if the plant is a flowering one the immature fruit. Trees, shrubs, and perennial herbs lose their aerial organs first, the roots usually being the last part of the plant to die. Bulbous and tuberous plants, even when immature, form their bulbs and tubers quite rapidly when caused to die by drought.

Influence of the awns of grasses, S. Treyakov (*Khozyaĕne, 1902, No. 6, pp. 188–191; abs. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *3* (*1902*), *No. 2, pp. 239, 240*).—The influence of the awns on the development of the grain in red winter bearded wheat was studied by the author at the Poltava experiment field. Two plats were selected, in one of which all the awns were removed from the spike as soon as they appeared, while upon the other they were allowed to remain. The ripening began 2 days earlier in the case of those spikes deprived of their awns. The yield of grain, as well as the ash analysis, is shown, from which the conclusion is drawn that the absence of awns is accompanied by a smaller-sized grain and by less weight. The grain from the awnless spikes was richer in ash but poorer in nitrogen and phosphorus. Comparisons were made with the figures obtained in this experiment, and the results of growing bearded and beardless varieties of wheat were found analogous in each case. By comparing the average yields of awned and awnless wheat for a number of years the author concludes that awned varieties, under the conditions of cultivation at the experimental field, gave smaller yields of grain, but the individual grain possessed a higher absolute weight, and the fluctuations of the bearded wheats are less than those of the beardless varieties.—P. FIREMAN.

Influence of the fluctuation of temperature on the respiration of seeds and embryos of wheat, Karchevski (*Mem. Warsaw Univ.*, *9* (*1901*), *pp. 114; abs. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *3* (*1902*), *No. 2, p. 241*).—The investigations here reported were conducted to ascertain how the seeds and embryos of wheat are affected by being subjected to elevated temperatures. The subjects experimented upon were placed for 24 hours in water before the determination of the carbon dioxid exhalation was begun. As a result of 24 experiments the author concludes that the energy of carbon dioxid respiration is 12 times as great in the case of the embryos as in the seeds themselves. The preliminary drying of the embryos at temperatures of 62° for 24 hours does not exert any appreciable influence on the respiration. If heated to 70° C. a reduction is observed, and at 98.5° C. there is a complete cessation of the exhalation of carbon dioxid and death of the embryo. With the seeds no change takes place even when dried up to temperature of 91° C. A rapid fall in the respiration of carbon dioxid begins if dried for 24 hours at 98 to 105°, and at 112° death results. These figures were obtained with seeds and embryos which were subjected to elevated temperature in a dry condition. If the same temperatures are attained in water, the death point is found to be considerably lower.—P. FIREMAN.

Influence of light on the respiration of some of the lower fungi, N. A. Maximow (*Centbl. Bakt. u. Par., 2. Abt.*, *9* (*1902*), *Nos. 6–7, pp. 193–205; 8, pp. 261–272, figs. 2, dgms. 18*).—The results of a prolonged series of experiments with *Aspergillus niger*, *Mucor stolonifer*, *Penicillium* sp., *Oidium lactis*, *Micrococcus prodigiosus*, and *Proteus vulgaris* are given. The organisms were grown in culture media, and the effect of light and darkness on the carbon dioxid production was determined. The experiments with *Aspergillus niger* and *Mucor stolonifer* are reported at considerable length. It was found in the case of Aspergillus that the influence of light on respiration was dependent upon the age of the fungus and the conditions of nutrition. With young, well-nourished cultures light had no effect on respiration. With old cultures the action of light promoted respiration. The effect of light usually became apparent in about 30 minutes and continued as long as the conditions remained constant. By repeatedly changing from light to darkness the flasks in which the organisms were grown, the stimulating influence of the light was greatly diminished. With *Mucor stolonifer* light had a positive stimulating effect for the first half hour, but if continued much beyond that time it proved detrimental to the respiration of the mold.

Investigations on the respiration of plants, B. Plovtzev (*Zap. Imp. Akad. Nauk, 22 (1901), No. 7; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 3 (1902), No. 2, pp. 233–237*).—A critical review is given of investigations relating to the subject of plant respiration.—P. FIREMAN.

The irritability of stigmas as a means for the prevention of the germination of foreign pollen, W. Burck (*Proc. Sec. Sci., Koninkl. Akad. Wetensch. Amsterdam, 4 (1901–2), pp. 184–193*).—The results of a study of the irritable stigmas of *Torenia fournieri* and of *Mimulus luteus* are given, in which comparisons are made with a number of other plants possessing broad stigmas which are more or less sensitive. As a result of these studies the author claims that the movements present in the stigmatic lips serve to protect the flowers against the entrance of foreign pollen. In a number of experiments he found that the pollen of other species would germinate upon the stigmas of a given plant, but by the rapid closing of sensitive stigmatic surfaces the liability to fecundation was greatly reduced. If pollen from the same species be placed upon the stigmatic surfaces the lobes closed and opened only after a considerable duration of time, if at all, while if mechanical stimulus or foreign pollen be present the stigmas reopen within a quarter of an hour.

The necessity of lime for seedlings, especially those grown at high temperatures, L. von Portheim (*Sitzber. K. Akad. Wiss. Math. Naturw. Cl. [Vienna], 110 (1901), No. 4, pp. 113–157*).—After reviewing and discussing considerable literature on the rôle of lime in plant nutrition, the author gives an account of experiments with seedlings of peas, lentils, beans, vetches, castor beans, flax, buckwheat, poppy, hemp, sunflower, pine, larch, and various cereals to ascertain the effect of a lack of lime in the media in which the plants were grown. After sprouting the seed between blotters wet with distilled water, the seedlings were transferred to pots containing clay shale and nutrient solutions added that varied only in the presence or absence of calcium nitrate. The plants were watered from time to time with spring or distilled water, dependent on the presence of lime in the nutrient media used. The growth of the different seedlings was noticed daily, especially the effect of raising the temperature to from 30 to 35° C. In many cases, but not all, the development of the hypocotyl and roots was much greater in the pots containing lime. The peculiar feature of nearly all the experiments was the turning brown and dying of the roots of the seedlings grown in the pots which had received no lime. In the case of the leguminous seedlings this took place within a few days. All the plants after a time became weakened and diseased, and the time difference between the 2 lots was assumed to show the necessity for lime for that particular plant. Increasing the temperature showed a marked effect on the condition of the 2 lots of plants, those without lime apparently suffering the most.

According to the author, his experiments show that the presence or absence of lime is immaterial for seedlings of cress, sorrel, rye, barley, wheat, oats, larch, and pine. The injurious effect of the absence of lime, as shown by Schimper, is attributed to the great quantity of potassium oxalate which is deposited within plants grown in the absence of lime. A brief bibliography completes the paper.

The solvent power of plants for mineral phosphates (*Rev. Gén. Agron. [Louvain], 11 (1902), No. 7–8, pp. 337–341*).—The results of an extended series of experiments with a large number of species of plants are given, from which it appears that the solvent power of mineral phosphates varies widely with different classes of plants. The cereals and grasses seem to possess this power in a limited way and leguminous plants to a considerably increased degree. Cruciferous plants and buckwheat are able to dissolve the mineral phosphates quite readily, as are potatoes and some other crops. A knowledge of the ability of crops to render soluble the mineral phosphates in fertilizers is an advantage in determining what fertilizers to use.

The physiological rôle of nicotin in the tobacco plant, G. Albo (*Contrib. Biol. Veg. Roy. Ist. Bot. Palermo, 3 (1902), No. 1, pp. 69–91*).—In the author's investigations on the rôle of nicotin in the tobacco plant he found that this substance does not occur in the seed, but a substance similar to solanin is abundant in the seed and during the process of germination aids materially in the development of the plant. When the young seedlings have become well established and assimilation has begun, nicotin appears in certain cells of the hypocotyl and in the leaves, and later the alkaloid is found distributed throughout all the tissues. The total amount of nicotin in a plant varies with the conditions under which the plant is grown. If of 2 plants cultivated side by side the top be cut from one and the other allowed to flower and mature its seed, the greatest amount of nicotin will be found in the plant which has been topped, in some cases amounting to 3 times as much as that found in the plant which is allowed to mature. The nicotin which is formed by the plant is carried to the seed and there transformed into solanin or some similar substance. The experiments conducted with plants in darkness and in atmospheres deprived of carbon dioxid seem to indicate that nicotin has its origin in the leaves and that it is one of the products dependent upon the assimilation by the plant. Nicotin, it is claimed as the result of the author's investigation, is either directly or indirectly concerned in the nutrition of the tobacco plant.

The biology of asexual reproduction of flowering plants, A. Terracciano (*Contrib. Biol. Veg. Roy. Ist. Bot. Palermo, 3 (1902), No. 1, pp. 1–68, pls. 6*).—The asexual reproduction of phanerogams is held by the author to be a device on the part of many plants to provide against the possibility of a failure of reproduction through seed. Such plants are less plastic than those grown from seed, a fact often taken advantage of in grafting, budding, etc. The different forms and conditions under which asexual reproduction may take place are enumerated, and the various biological phenomena observed by the author are described. The author's investigations were made on a number of species of plants, many of which were cacti, euphorbias, etc. The anatomical structure and biological relationships between parent plant and offshoot are to be treated in a subsequent paper.

Root tubercles of Datisca cannabina, A. Trotter (*Bul. Soc. Bot. Ital., 1902, No. 2–3, pp. 50–52; abs. in Bot. Centbl., 90 (1902), No. 8, p. 196*).—A preliminary note is given describing root tubercles which have recently been studied by the author, and he shows that they are formed by masses of fundamental tissue which contains hypertrophied nuclei but little or no starch, and the principal content of the cells is made up of bacteria which greatly resemble those known as *Bacillus radicicola.*

Green hemiparasites, E. Heinricher (*Jahrb. Wiss. Bot. [Pringsheim], 37 (1902), No. 2, pp. 264–337, pls. 2; abs. in Jour. Roy. Micros. Soc. [London], 1902, No. 4, pp. 451, 452*).—Descriptions are given of culture experiments made with Euphrasia with a view of ascertaining whether the chemical properties of the host plant were prejudicial to the growth of the parasite. It was found that both Euphorbia and Oxalis serve equally well as host plants in spite of the widely different chemical qualities of their cell sap. The claim that monocotyledons serve exclusively as host plants for these semiparasites is shown to be wrong, the author cultivating 3 species on widely different host plants, obtaining perfect development in every case. It was also shown that a single individual may attach itself at the same time to the roots of at least 2 different hosts. Investigations were also made on the relation of nutrition to the general habit of the plants. Studies were undertaken to decide how far parasitism was capable of being replaced by a saprophytic habit, and it is shown that while a portion of plants grown in river sand came to flower a much larger portion matured when grown in humus cultures.

The seed fungus of the darnel, E. M. FREEMAN (*Proc. Roy. Soc.* [*London*], *71* (*1902*), *No. 467, pp. 27–30*).—The presence of a considerable layer of hyphæ about the seed of the darnel (*Lolium temulentum*) was shown by Guérin several years ago (E. S. R., 11, p. 906), but thus far nothing has been ascertained regarding the method of infection of the plant. The author has carried on a series of experiments and has ascertained that in addition to the well-known hyphal layer surrounding the aleurone, there is a patch of hyphæ just outside of and contiguous to the base of the scutellum. From this area can be traced an abundant mycelium which penetrates the growing point of the embryo in the seed and thus affects the young growing point. No trace of any spores has been found and their presence seems unnecessary to the ordinary life cycle of the fungus. Other varieties and species of Lolium occasionally contain a hyphal layer which is probably identical with that of the darnel. The fungus layer is found in a varying proportion of the grains. All attempts to obtain cultures of the nuclear hyphæ have failed, indicating either that the hyphæ have lost their vitality, or, what is believed to be more probable, they are too closely adapted to symbiotic life to allow of artificial cultivation. There is believed to be no reason for the supposition of any so-called mycoplasm in the embryo, as the fungus is nearly always present as distinct hyphæ.

ZOOLOGY.

Judging the benefits and injuries produced by insectivorous birds, K. ECKSTEIN (*Verhandl. V. Internat. Zool. Cong. Berlin, 1901, pp. 512–519*).—Attention is called to the serious difficulties connected with the problem of determining the economic relations of insectivorous birds. Many species of injurious insects upon which these birds feed have natural limitations to their distribution, and various natural enemies assist in holding these insects in check. The parasitic and predaceous insects as well as fungus and bacterial diseases and unfavorable climatic influences must be considered as factors of some importance. The problem of determining just how much benefit insectivorous birds produce by their feeding habits is therefore a difficult one. The author believes that the laws which have thus far been passed offering protection for certain species of birds and withholding it from others might be improved in numerous instances.

Birds and insects in relation to agriculture, E. H. FORBUSH (*Trans. Massachusetts Hort. Soc., 1902, I, pp. 95–101*).—A popular discussion of the agency of birds in controlling the multiplication of injurious insects.

A partial bibliography of the economic relations of North American birds, C. M. WEED (*New Hampshire Sta. Tech. Bul. 5, pp. 137–179*).—The author has compiled a list of the more important works on American economic ornithology, from 1808 to 1901, inclusive. The number of titles listed is nearly 300 and the titles are arranged in their chronological order.

Measures to be adopted for bird protection in Egypt, W. I. BEY (*Jour. Khediv. Agr. Soc. and School Agr., 4* (*1902*), *No. 6, pp. 247–252*).—Under existing laws in Egypt the slaughter of all kinds of birds has proceeded at a rapid pace. The author believes that restrictions must be placed upon hunters in order that some of the more valuable insectivorous birds may be saved from destruction.

Birds of New Zealand, D. V. LUCAS (*Jour. and Proc. Hamilton Sci. Assoc., 1901–2, No. 18, pp. 20–29, figs. 4*).—Notes are given on the habits and economic relations of the kea, cuckoo, crows, tui, huia, kiwi, and moa.

Destroying sparrows (*Agr. Gaz. New South Wales, 13* (*1902*), *No. 12, p. 1197*).—The best results in killing English sparrows were obtained from dissolving 1 oz. strychnin in 14 fluid oz. absolute alcohol and 4 pts. hot water. After the solution is cold, water is to be added to bring the quantity up to 4 gal. One bushel of wheat is then soaked for 48 hours in this solution and spread out in suitable situations.

Woodpeckers (*California Bd. Hort. Rpt. 1901–2, pp. 175–178*).—Popular notes on the habits of insects with special reference to their economic relations.

The quest of rabbit extermination and the question of disease (*Pastoralists' Rev., 12 (1902), Nos. 6, pp. 395, 396; 7, pp. 474, 475*).—A review is given of the extensive investigations which were stimulated by the offer of $125,000 made by the government of New South Wales in 1888 for a successful remedy in exterminating rabbits. While all of the nearly 1,500 plans which were proposed were unsuccessful, the author believes that better results may perhaps be obtained at present, and recommends that the Australian government offer a much larger reward for a satisfactory method of exterminating rabbits.

The plague of rats, T. Skschivan (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 4, Orig., pp. 260–273*).—Considerable interest attaches at present to the study of diseases which affect rats on account of the agency of these animals in transmitting contagious diseases, especially the bubonic plague. Three species of rats are influential in carrying infectious diseases; these are *Mus decumanus*, *M. rattus*, and *M. alexandrinus*. Notes are given on a number of diseases of rats resembling bubonic plague, and the author presents the details of post-mortem findings in 15 rats apparently dead of the plague. In order to secure a check upon the post-mortem examinations, guinea pigs were inoculated with the material obtained from these rats.

A bacillus pathogenic for the house rat, C. Toyama (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 4, Orig., pp. 273–281*).—Detailed notes are given on the post-mortem findings in rats which had died of apparently an infectious disease. A microscopic examination was made of material obtained from various organs of the dead rats. A number of inoculation experiments were made in mice and rats with material obtained from these cases and notes are given on the artificial infection thus produced. Death resulted in the majority of cases between from 5 to 53 days, with symptoms similar to those of spontaneous cases of the disease in rats. Notes are given on the behavior of the bacillus on various culture media. No capsules or spores could be detected, and the bacillus is motile. It is believed to be closely related to *Bacillus typhi murium*, but is considered as a distinct species.

Mouse and rat plague, E. Wiener (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 9, pp. 1009–1035*).—The author presents a critical review of the various attempts which have been made to discover and isolate a pathogenic organism which can be used successfully in killing mice and rats. It is believed, as a result of the author's investigations, that the various organisms which have been experimented with and recommended for this purpose by different authors are all of the same species. A number of cultures which were received for testing during these experiments proved to be nonvirulent.

Infection with Trypanosoma, T. von Wasielewski (*Verhandl. V. Internat. Zool. Cong. Berlin, 1901, pp. 424–428*).—A brief discussion is given of the means and effects of infection by various species of Trypanosoma in animals, especially in frogs and rats.

Twenty-fourth annual report of the South Australian Zoological and Acclimatization Society (*Rpt. South Australian Zool. and Acclim. Soc., 24 (1902), pp. 45, pls. 4*).—Notes are given on the wild animals which have been collected at the Adelaide Zoological Garden and on the hygienic conditions which prevail among these animals. Brief descriptions are given of Burchell's zebra, Barbary sheep, and kangaroo, and a detailed list is presented of the various animals in the zoological garden at the present time.

Phytopathological observations with special regard to Vierlande near Hamburg, with contributions to the fauna of Hamburg, L. Reh (*Sta. Pflanzenschutz, Hamburg, 4 (1901–2), pp. 111–223, pl. 1*).—Brief descriptive notes are given of Vierlande, with an account of excursions made through that country. The author discusses the various diseases due to unknown causes, climatic conditions, parasitic fungi, and animals as observed during his excursions about Hamburg. The animal pests are classified into Mammals, birds, mollusks, insects, mites, and worms, and insects are further subdivided into families and smaller groups. A brief general account is presented of the means of combating these pests.

Zoological record, D. Sharp (*Zool. Rec., 38 (1901), pp. 1144*).—As usual, the present volume of this publication contains a list of titles published on zoological subjects during the year covered by the report. The number of periodicals from which these titles were taken is more than 1,000. A list of these periodicals is given and the general bibliographical matter is arranged as previously, under the following heads: General subjects, mammalia, aves, reptilia, batrachia, pisces, tunicata, mollusca, brachiopoda, bryozoa, crustacea, arachnida, myriopoda, prototracheata, insecta, echinoderma, vermes, cœlenterata, spongiæ, and protozoa.

Index zoologicus, C. O. Waterhouse (*London: Zool. Soc. of London, 1902, pp. XII + 421*).—This index is prepared for the purpose of including an alphabetical list of the names of genera and subgenera proposed for use in zoology, as recorded in Zoological Record, 1880–1900, and other zoological generic names not included in the Nomenclator Zoologicus of S. H. Scudder. The number of new names indexed in the Zoological Record are tabulated for each year from 1880 to 1900. It is estimated that the total number of names included in this index is about 40,000, and that the total number of zoological generic names, exclusive of synonyms, is thus brought up to about 80,000.

Index-catalogue of medical and veterinary zoology, C. W. Stiles and A. Hassall (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 39, pt. 2, pp. 47–198*).—In this part of the bulletin the author index of veterinary and medical zoology is continued and includes all names beginning with B.

Guide for collecting, preserving, and packing animals for the zoological museum in Berlin, Möbius (*Anleitung zum Sammeln, Konservieren und Verpacken von Tieren für das zoologische Museum. Berlin: Zoological Museum, 1902, pp. 113, figs. 25*).—Notes are given on the approved methods of collecting, preserving, and packing animals of all kinds for shipment to the museum. These notes are prepared as a guide to travelers or colonial officials of the German Government who may wish to collect specimens for the museum.

Game laws for 1902, T. S. Palmer and H. W. Olds (*U. S. Dept. Agr., Farmers' Bul. 160, pp. 56*).—This is a revised and condensed form of Bulletin 16, Division of Biological Survey (E. S. R., 13, p. 532).

METEOROLOGY.

Monthly Weather Review (*Mo. Weather Rev., 30 (1902), Nos. 10, pp. 473–510, figs. 2, charts 8; 11, pp. 511–552, figs. 4, charts 10; 12, pp. 553–602, figs. 37, charts 10*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of October, November, and December, 1902, recent papers bearing on meteorology, etc., these numbers contain the following articles and notes:

No. 10.—Special contributions on Cloudbursts, by A. D. Elmer; Does the Lightning Ever Strike the Ocean? by J. Trowbridge; The Climate of Baguio, Philippine Islands, by F. O. Stetson; Some Peculiarities in Frost Formation over the Coast Region of South Carolina, by L. N. Jesunofsky (p. 845); Cycles of Precipitation (illus.), by L. H. Murdoch (p. 845), and The Circumhorizontal Arc, by L. Besson; and notes on Weather Bureau men as instructors in meteorology, waterspout at Cape May, N. J., severe hailstorm at St. Louis, Mo., volcanic and atmospheric phenomena (illus.), and Robert Rubenson.

No. 11.—Special contributions on November Gales from the Great Lakes to the

Maritime Provinces, by B. C. Webber; Annual Wind Resultants (illus.), by T. H. Davis; and The Climatology and Water Power of Porto Rico, by W. H. Alexander; and notes on Tromholt's catalogue of Norwegian auroras, Maryland climatology, Samuel B. Pfanner, Australian droughts and the moon, shadow bands—scintillation—interference bands, meteorological stations in Africa, and analogous storms.

No. 12.—Special contributions on Studies on the Meteorological Effects of the Solar and Terrestrial Physical Processes (illus.), by F. H. Bigelow; Cloud Bursts, by H. H. Ten Broeck; An Explanation of Wireless Telegraphy (illus.), by A. H. Thiessen; and Radioactivity of Freshly Fallen Snow, by S. J. Allan; and notes on meteorology at the American Association, the Becquerel rays in meteorology, and H. H. Moore.

Some peculiarities in frost formation over the coast region of South Carolina, L. N. Jesunofsky (*Mo. Weather Rev., 30 (1902), No. 10, pp. 479–481*).—The article records and discusses observations extending over a number of years on the occurrence of spring and autumn and winter frosts on the truck farms in the vicinity of Charleston. Injury done by frost in this locality varies widely in adjoining fields and even in different parts of the same field. Various explanations of this phenomenon have been offered, viz, difference in air drainage, excessive use of fertilizers, variations in ground water, warm air, currents, and salt air, are discussed, but none is shown to be satisfactory.

Cycles of precipitation, L. H. Murdoch (*Mo. Weather Rev., 30 (1902), No. 10, pp. 482–485, fig. 1*).—This article deals with cycles of precipitation at Salt Lake City and at other places in the United States. The author finds for Salt Lake City a dry cycle between 1827 and 1864, during which the average annual rainfall was about 15 in.; a wet cycle from 1865 to 1886, with an average annual precipitation of 18.42 in.; and from 1887 to 1901 a dry cycle during which the average annual precipitation was 15 in. From records for San Francisco, Sacramento, Denver, Omaha, St. Louis, Cincinnati, and Baltimore, it appears that the country west of the Rocky Mountains had its wettest cycle from 1866 to 1887, while the Middle Mississippi and Ohio valleys had the heaviest precipitation from 1840 to 1859. The present dry cycle is general from San Francisco to Baltimore. The author finds no relation between his rainfall curves and Wolfer's sun-spot tables, and concludes "that there is no known natural law by which we can predict the length of the present dry cycle."

Meteorology, J. B. Harrison (*Rpt. Agr. Work Bot. Gard. [British Guiana], 1896–1901, pp. 4–12*).—Summaries are given of observations on the amount and composition (chlorin, ammonia, and nitrates) of the rainfall, on sunshine, and on the effects of the seasons on crop growth during the years 1896–1901. The mean rainfall for the period was 83.6 in.

"The weather during the years 1896–1901 . . . varied greatly from year to year, and while in no year was it consistently throughout the year favorable for either work in the field or for continued active growth or maturation of the sugar cane, in some of them, as in 1898, 1899, and 1900, serious interruptions to the growth and welfare of the sugar cane, as well as of all other crops, were caused by the occurrence of long-continued periods of drought. In the report last issued it was recorded that during a period of five years, of which 1893 was the climax, there had been a succession of years marked by exceedingly heavy rainfalls, averaging an annual fall of 124.47 in., and that during the years 1894 and 1895 the rain had been more nearly normal, amounting approximately to 84 in. per annum, as compared with a mean annual recorded fall of 94.35 in."

Arranging the data so as to show the distribution of rainfall over the wet seasons (December and January, May–August), the dry seasons (February, March, and April; September, October, and November), and the period of growth (December–September) it is found "that the best results with regard to sugar products have been as a rule . . . obtained with rainfalls of from 65 to 70 in. during the [period of growth] and that the occurrence of heavy and well-distributed rainfalls in the months of May and June or June and July are of the first importance. . . . The rain during the period under review contributed an average of 121 lbs. of chlorin, equivalent to, in round numbers, 200 lbs. of common salt per acre, and 1.99 lbs. of combined nitrogen, the equivalent of, in round numbers, 8 lbs. of sulphate of ammonia."

The climatology of Africa, E. G. RAVENSTEIN ET AL. (*Rpt. British Assoc. Adv. Sci., 1901, pp. 383–395, figs. 2*).—This is the tenth and final report of the committee appointed by the association to report on this subject, and gives summaries of observations during the year ended May 31, 1901, on pressure, temperature, precipitation, humidity, evaporation, prevailing wind, etc., at 21 stations in Africa, "including Asiut and Omdurman; Old Calabar; Blantyre, Lauderdale, Fort Johnston, and Nkata Bay, in Nyasaland; Kisimayu, Malindi, Lamu, Takaunga, Mombasa, and Shimoni, on the coast of British East Africa; Machako's, Kitui, Nairobi, and Kikuyu, in the interior of that Protectorate; and from the four lake stations in Buganda." There are also added the results of 7 years' observations on the rainfall at Mengo (Buganda), taken from the unpublished journal of A. M. Mackay, and a table giving the rainfall since 1890 at a number of stations.

Rainfall and temperature at Pretoria, J. L. SOUTTER (*Transvaal Agr. Jour., 1 (1902), No. 1, pp. 53–56*).—Summaries are given of observations on rainfall from July, 1891, to June, 1902, inclusive, and on shade temperature during the 15 months ended September 30, 1902.

Meteorological report of the State of Florida for the year 1901, A. J. MITCHELL (*Rpt. Comr. Agr. Florida, 1901 and 1902, pp. 220–235*).—This is a report by the director of the Florida section of the climate and crop service of the U. S. Weather Bureau on temperature, precipitation, cloudiness, wind movement, dates of first and last frosts, etc., at a large number of places in the State. The mean temperature during 1901 was 68.8° F., the precipitation 58.47 in.; the means for 10 years, including 1901, were 70.6° and 52.73 in., respectively.

Meteorological observations, W. B. ALWOOD (*Virginia Sta. Rpt. 1902, pp. 10, 11*).—Tables are given which show monthly averages of observations at Blacksburg, Va., on temperature, precipitation, direction of wind, and cloudiness for the calendar year 1902; and monthly means of temperature and precipitation during 10 years (1893–1902). The mean temperature for the year ended December 31, 1902, was 52° F., the precipitation 33.78 in.

Meteorological observations on Ben Nevis, A. BUCHAN ET AL. (*Rpt. British Assoc. Adv. Sci., 1901, pp. 54–60*).—This is the report of the committee of the association appointed to cooperate with the Scottish Meteorological Society in making observations at the two Ben Nevis observatories, and gives summaries of observations during 1900 on pressure, temperature, rainfall, sunshine, cloudiness, wind movement, and casual phenomena.

Meteorological observations at the agricultural-chemical experiment station of Breslau, B. SCHULZE (*Jahresber. Thät. Agr. Chem. Vers. Stat., Provinz Schlesien, 1901–2, pp. 5, 6, tables 15*).—Detailed daily, monthly, and annual summaries are given of observations on pressure, temperature, humidity of the air, sunshine, wind movement, and rainfall for the period from January, 1901, to March, 1902, inclusive.

On the seasonal variation of the atmospheric temperature of the British Isles and its relation to wind direction, W. N. SHAW and R. W. COHEN (*Rpt. British Assoc. Adv. Sci., 1901, pp. 558–560*).

On the effect of sea temperature upon the seasonal variation of air temperature of the British Isles, W. N. SHAW (*Rpt. British Assoc. Adv. Sci., 1901, pp. 560, 561*).—An analysis of observations on atmospheric temperature "shows that there is a considerable lag in the occurrence of the seasonal variations of temperature at coast stations as compared with inland stations, and a still greater lag in the variations of temperature in the sea itself.

The mean temperature of the atmosphere and the causes of glacial periods, H. N. Dickson (*Rpt. British Assoc. Adv. Sci., 1901, pp. 722, 723*).

On the systematic exploration of the atmosphere at sea by means of kites, A. L. Rotch (*Rpt. British Assoc. Adv. Sci., 1901, p. 724*).—See also E. S. R., 13, p. 626.

Recurrence of rain—The relation between the moon's motion in declination and the quantity of rain in New South Wales, H. C. Russell (*Jour. and Proc. Roy. Soc. New South Wales, 35 (1901), pp. 113–115*).—An analysis of rainfall records is made which indicates that rainfall is abundant "when the moon is in certain degrees of her motion south, and when the moon begins to go north then droughty conditions prevail for seven or even eight years, a phenomena repeated for three periods of nineteen years each." The author believes that there is a law connecting the two phenomena.

Instructions for obtaining and tabulating records from recording instruments, C. F. Marvin (*U. S. Dept. Agr., Weather Bureau Doc. 277, pp. 31, figs. 2*).—A second edition of this bulletin.

On the inverse relation of chlorin to rainfall, W. Ackroyd (*Rpt. British Assoc. Adv. Sci., 1901, p. 603*).—From an analysis of observations on the chlorin content of rainfall it "clearly appears that minimum amounts of rainfall are marked by maxima of chlorin contents, and vice versa."

Weather maps, W. N. Shaw (*Rpt. British Assoc. Adv. Sci., 1901, p. 725*).—This note refers to an exhibit of the daily weather maps of 23 countries.

International catalogue of scientific literature. F—Meteorology (*Internat. Cat. Sci. Lit., 6 (1902), pp. XIII + 184*).—A partial list of references to the literature of meteorology, including terrestrial magnetism, appearing during 1901. The references to meteorological literature omitted from this volume are to be included in the next annual issue of the catalogue.

WATER—SOILS.

Contributions from the royal testing station for water supply and sewage disposal of Berlin, A. Schmidtmann and C. Günther (*Mitt. Kgl. Prüfungsanstalt Wasser. u. Abw., Berlin, 1902, No. 1, pp. 166*).—These include the following papers: The Principles of the Biological Examination of Water with Reference to Flora and Fauna, by R. Kolkwitz and M. Marsson; Purification on the Filter in the Biological Process of Purification, and The Constituents of the Scum Which Forms on the Surface of Sewage in Tanks in Biological Purification Methods, by O. Emmerling; The So-called Biological Processes of Sewage Purification, by K. Thumm; Garbage Disposal with Special Reference to its Agricultural Utilization, by H. Thiesing; The Utilization of the Sewage Sludge of Cassel, by Höpfner and Paulmann; and An Automatic Zero Point Burette, by C. Zahn.

Purification of drinking water by distillation, G. Coupan (*Jour. Agr. Prat., n. ser., 5 (1903), No. 8, pp. 255–259, figs. 4*).—A discussion of general principles and descriptions of various methods and forms of apparatus.

Artesian water in the State of Queensland, Australia, R. L. Jack (*Rpt. British Assoc. Adv. Sci., 1901, p. 641*).—An account is given of the artesian area and of borings for artesian water, one of which extended to a depth of 5,040 ft. The largest flow obtained was 6,000,000 gal. daily. The artesian area is estimated at 264,600 square miles.

The movements of underground waters of Northwest Yorkshire, W. W. Watts et al. (*Rpt. British Assoc. Adv. Sci., 1901, pp. 337–339*).—This is the report of a committee of the association and gives the results of an inconclusive study by means of fluorescein of the underground course of a small stream.

On the distribution of chlorin in Yorkshire, II, W. Ackroyd (*Rpt. British Assoc. Adv. Sci., 1901, p. 603*).—As a result of many observations, it is shown that chlorin increases from 0.7 to 1 part per 100,000 of water in the west and northwest, where the rivers originate, to 1.7 to 2 in the east and southeast. The normal chlorin content apparently increases in the vicinity of manufacturing centers, and is also increased by the prevalence of high winds from the sea.

On the circulation of salt and its geological bearings, W. Ackroyd (*Rpt. British Assoc. Adv. Sci., 1901, pp. 654, 655*).—The bearing of the salt carried inland from the sea on estimates of the geological age of the earth and on the saltiness of inland lakes and salt hills is discussed.

On the supply of sodium and chlorin by the rivers to the sea, E. Dubois (*Proc. Sec. Sci., Koninkl. Akad. Wetensch. Amsterdam, 4 (1901–2), pp. 388–399*).

On the diffusion of water in humus soils, E. Blanck (*Landw. Vers. Stat., 58 (1903), No. 1–2, pp. 145–160*).—A series of experiments is reported which shows that the presence of acid humus compounds in a soil hinders the diffusion of water, a condition which may be corrected by adding a neutralizing agent such as lime.

The soils of Dominica, F. Watts (*Barbados: Imp. Dept. Agr. West Indies, 1903, pp. 32, figs 25*).—Physical and chemical analyses of 23 samples of soil from different parts of the island are reported, with a discussion of the results and description of the method employed. In general the soils were found to contain only very moderate amounts of carbonates. They were generally deficient in phosphoric acid, but contained considerable amounts of assimilable potash.

The method followed in preparing the acid extract of the fine earth for chemical analysis was as follows: "Twenty grams of 'fine earth' are placed in a round-bottomed 250 cc. flask with 200 cc. of hydrochloric acid of specific gravity 1.115. A stopper (usually cork) is loosely inserted. The flask is placed in the water bath in the afternoon, the bath brought to boiling point, the lamp removed and the flask allowed to remain in the bath all night. Next morning the bath is brought to boiling by about 10 a. m., and maintained in that condition throughout the day. At 4 p. m. the lamp is removed and the flask allowed to remain in the bath all night. During the process of heating the flasks are repeatedly shaken. The following morning the contents of the flasks are removed, filtered, and the residue well washed; the filtrate, including the washings, is evaporated to dryness after the addition of a few drops of nitric acid. The residue is taken up with a little water containing a few drops of hydrochloric acid and again evaporated to dryness. After drying, it is again taken up with a little water and acid as before and filtered, washing well with warm water. After cooling the solution is made up to 500 cc."

Ordinary methods were employed in the determination of most of the constituents. In case of carbonates, however, a special process is described which it is claimed "is both simple and accurate, and allows relatively large quantities of soils to be taken for the determination when necessary," a consideration which is of special importance in case of volcanic soils, such as those of the West Indies. The method consists essentially of adding strong hydrochloric acid to a quantity of soil capable of yielding 50 to 100 cc. of lime (about 25 gm. in case of the soils examined), collecting the gas evolved over mercury by means of a simple Sprengel pump, and titrating with excess of barium hydrate and fifth-normal hydrochloric acid. The details of the method and of the apparatus needed are described.

Nitrogen was determined by the Kjeldahl method. No attempt was made to determine humus directly. Organic carbon was determined by the method of Cross and Bevan[a] and humus calculated by multiplying carbon by 1.724. Assimilable phosphoric acid and potash were determined by Dyer's method. Osborne's method of mechanical analysis was employed.

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[a] Jour. Chem. Soc. (Trans.), 53 (1888), p. 890.

Geology regarded in its economic application to agriculture by means of soil maps, J. R. Kilroe (*Rpt. British Assoc. Adv. Sci., 1901, pp. 643–645*).—This paper discusses the utilization of geological information in the valuation of land, the improvement of estates, and in schemes of irrigation and drainage, and explains how the drift maps of the British Geological Survey may be made more useful for this purpose.

The source of nitrogen in forest soil, R. G. Zon (*Pop. Sci. Mo., 62* (*1903*), *No. 5, pp. 436–440*).—A brief discussion of this subject based mainly upon the results of observations by E. Henry, of the University of Nancy, France, that freshly fallen leaves absorb atmospheric nitrogen in the process of decomposition.

The natural improvement of soils, E. B. Voorhees (*Pennsylvania Dept. Agr. Bul. 102, pp. 50, pls. 4*).—A nontechnical discussion of facts and principles, explaining the chemical, physical, and biological differences in soils, the conservation of moisture, tillage, mulching, and the use of lime and leguminous plants in improving soils.

Studies on the distribution of lime in the soils of vineyards, J. Dufour and H. Faes (*Chron. Agr. Canton Vaud, 15* (*1902*), *Nos. 19, pp. 547–551; 20, pp. 576–579; 21, pp. 609–612; 23, pp. 655–661; 24, pp. 696–700*).—The continuation and conclusion of an article part of which has already been noted (E. S. R., 14, p. 231). Analyses with reference to lime content of the soils of a large number of Swiss vineyards are reported.

A contribution to the chemical study of peat soils, G. Ongaro (*Staz. Sper. Agr. Ital., 35* (*1902*), *No. 11–12, pp. 897–909*).—Analyses of a number of samples of peat soils are reported, with results of plat experiments on wheat and oats to determine their fertilizer requirements.

On the treatment of moor soils, G. Grotenfelt (*Finska Mosskult. Aarbok, 1901, No. 1; abs. in Svensk Mosskult. Tidskr., 16* (*1902*), *No. 3, pp. 231–238*).

Notes on the occurrence of phosphatic nodules and phosphate-bearing rock in the upper carboniferous limestone (Yoredale) series of the West Riding of Yorkshire and Westmoreland border, J. Rhodes (*Rpt. British Assoc. Adv. Sci., 1901, p. 655*).

A case for soil investigations, R. Thiele (*Centbl. Bakt. u. Par., 2. Abt., 9* (*1902*), *No. 9, pp. 330–332, fig. 1*).—A case filled with the necessary apparatus for the study of soil organisms is described.

FERTILIZERS.

Peat soil as a soil amendment, H. von Feilitzen (*Svensk Mosskult. Tidskr., 17* (*1903*), *No. 1, pp. 11–19*).—Experiments conducted on sandy, clayey, and moorland soils showed that applications of humus or peat soil rich in lime and in nitrogen exert a very favorable influence on the productive capacity of these soils, largely through the mechanical improvement of the soils resulting from the increase in their humus contents, since a complete fertilization with nitrogen, phosphoric acid, potash, and lime was given in all cases. The experiments were conducted with four different crops—peas, oats, barley, and potatoes. If the yields harvested on the plats which did not receive a dressing with peat soil be placed at 100, the relative yields obtained as the result of applications of 66 to 264 cubic meters of peat soil per hectare (1,000 to 3,800 cu. ft. per acre), were as follows: Peas on sandy soil, seed 105, vines and pods 103, on clay soil 108 and 110, respectively; barley on clay soil, grain 125, straw and chaff 129; oats on sandy soil, grain 134, straw and chaff 129, on clay soil 118 and 154, respectively; potatoes on poor sandy soil 243 in 1899 and 143 in 1900, on sandy soil (old field) 109 in 1900, and on high moor soil 128 in 1900 and 113 in 1901.

The trials do not furnish decisive evidence as to the quantities of peat that should be applied, since the yields obtained increased with the quantities added, but in practice applications of 100 to 150 cubic meters per hectare (1,400 to 2,150 cu. ft. per acre) may be considered ample. The effect of the peat can be readily seen during several succeeding years.—F. W. WOLL.

Ammoniacal and nitric nitrogen, S. HALS (*Tidsskr. Norske Landbr., 9 (1902), No. 5, pp. 212–225*).—A résumé of the subject is given with an account of two series of experiments conducted by the author at Darmstadt Experiment Station, for the purpose of studying the question whether a moist, loamy soil is able to fix all nitrogen applied in form of ammonium sulphate. The experiments, which were made on small samples of soil in the laboratory, with and without addition of lime and water, showed that a loss of nitrogen through evaporation of ammonia can take place in a loamy soil rich in lime when small quantities of ammonium sulphate are added and the soil is exposed to the sun and wind. Liming and addition of water (increased evaporation of water) increase the evaporation of ammonia, and this is larger when the ammonium sulphate is strewn on the surface of the soil than when mixed with it.

In the change of ammonia to nitric acid in the soil a portion of the nitrogen has been found to disappear. According to Wagner, only 89 per cent is recovered. The result of the author's experiment would suggest that the loss is due to evaporation of ammonia. A nitrification experiment was made with a loamy soil containing 1.21 per cent lime (in the dry matter) and 15 per cent water, the soil being placed in glass cylinders provided with ground glass stoppers which were connected with a U-tube for the absorption of ammonia that might escape. The evaporation of water from the soil was thus reduced to a minimum and the ammonia that might escape could be collected and determined quantitatively. The results of the experiments showed that under these conditions no loss of nitrogen took place. During the 30 days in which the experiments lasted the ammoniacal nitrogen was not completely changed into nitric nitrogen, there being about 7 per cent of nitrogen unaccounted for, which in all probability had been changed into organic compounds.—F. W. WOLL.

The utilization of atmospheric nitrogen by agricultural plants, M. GERLACH (*Jahrb. Deut. Landw. Gesell., 17 (1902), pp. 20–25*).—A general discussion.

Studies in nitrification, G. S. FRAPS (*Amer. Chem. Jour., 29 (1903), No. 3, pp. 225–241, figs. 2*).—This has been noted from another source (E. S. R., 14, p. 110).

Notes on nitrification organisms, W. OMELIANSKI (*Centbl. Bakt. u. Par., 2. Abt., 9 (1902), Nos. 1–2, p. 63; 3–4, p. 113*).–Experiments are reported which go to show that the nitrification organisms do not cause the oxidation of incompletely oxidized mineral compounds, such as sodium sulphite and phosphite, and do not produce oxidizing enzyms.

Are there bacteria which assimilate free nitrogen or is this a chemical process? A. A. BONNEMA (*Chem. Ztg., 27 (1903), No. 14, pp. 148–150*).—It is suggested that the fixation of free nitrogen in the soil may be due to the catalytic action of iron hydroxid.

On the nitrogen content of the seed of lupines used as fertilizer, N. PASSERINI (*Staz. Sper. Agr. Ital., 35 (1902), No. 11–12, pp. 887–896*).—Analyses of the seed of different kinds of lupines and experiments with the seeds as a fertilizer for wheat in comparison with various other nitrogenous fertilizers are reported which show the high value of the seed as a nitrogenous fertilizer.

The preservation of barnyard manure, T. PFEIFFER (*Jahrb. Deut. Landw. Gesell., 17 (1902), pp. 166–177*).—A general discussion.

Compost heap and its management, M. SAUL (*Deut. Landw. Presse, 30 (1903), No. 9, pp. 67, 68*).—A brief note advising especially against deep plowing under of manure.

On the utilization of night soil in European cities, J. SEBELIEN (*Tidsskr. Norske Landbr., 9 (1902), No. 4, pp. 149–186*).

On experiments with manure and artificial fertilizers, O. Omre (*Tidsskr. Norske Landbr., 9* (*1902*), *No. 6, pp. 245–263*).

On the manuring of the soil in Algiers and Tunis, G. Ryf (*Bul. Dir. Agr. et Com.* [*Tunis*], *8* (*1903*), *No 26, pp. 69–78*).—A brief general discussion of the care, management, and use on different crops of farm manures.

On the organization of local fertilizer experiments in European countries, A. Rindell (*Landbr. Styr. Meddel., 1902, No. 41, pp. 44*).—A report on the organization of cooperative and other fertilizer experiments in the Scandinavian countries, England, and France.

The supplying of the phosphoric acid requirements of plants, P. Wagner (*Jahrb. Deut. Landw. Gesell., 17* (*1902*), *pp. 26–30*).—A general discussion of this subject.

Fertilizer experiments with phosphates, 1900–01, O. Reitmair (*Ztschr. Landw. Versuchsw. Oesterr., 6* (*1903*), *No. 2, pp. 95–194, pl. 1*).—Previously noted from another source (E. S. R., 14, p. 647).

On the question of the influence of a physiologically acid salt in rendering phosphorite soluble, I. Schulov (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *3* (*1902*), *No. 6, pp. 711–719, fig. 1*).—In continuation of previous experiments (E. S. R., 14, p. 343), the author made pot experiments with oats to determine whether the action of ammonium salts in rendering phosphorite soluble is due to changes (separation of base and acid) occurring in the soil or after the salts are absorbed by the plant. In one series of experiments the ammonium salt and the phosphorite were intimately mixed in the soil, in another series double pots were used in which the ammonium salt and the phosphorite were kept separate, though each was accessible to the plant. The results quite clearly indicate that the changes which result in increasing the assimilability of the phosphorite occur only when the ammonium salt is intimately mixed with the phosphorite in the soil.

Algiers phosphate against Thomas phosphate, A. Ystgaard (*Norsk Landmandsblad, 21* (*1902*), *No. 46, pp. 556, 557*).

Pot experiments with fertilizers, B. Schulze (*Jahresber. Thät. Agr. Chem. Vers. Stat., Provinz Schlesien, 1901–2, pp. 21–32*).—These included comparative tests during 2 years of kainit, muriate of potash and sulphate of potash on oats and barley, in which the largest yield and utilization of potash by the crop was shown in case of the muriate, sulphate being second as regards yield and third as regards utilization of potash by the crop; studies of the action of the phosphoric acid of steamed bone with and without the simultaneous application of lime, which showed the depressing effect of the latter on the former in experiments with oats; similar experiments which indicated that the nitrogen of steamed bone is somewhat more effective on oats than that of ammonium sulphate; experiments which showed a low effectiveness for the nitrogen of ground leather on white mustard as compared with ammonium sulphate; experiments on oats and peas which showed that acetylene gas residue has no injurious effect and produces fully as large yields as calcium carbonate; comparative tests which showed that the water-soluble phosphoric acid of superphosphate is more effective in increasing the yield of potatoes than the citrate-soluble acid of Thomas slag; comparative trials on oats, in which ammonium sulphate applied one-half before seeding and one-sixth in each of 3 top-dressings during the growing season gave better results than nitrate of soda applied one-half before seeding and one-third in each of 2 top-dressings afterwards; and a reference to experiments on the replacement of potash by soda.

Fertilizer experiments with kainit and 40 per cent potash salt, B. Schulze (*Jahresber. Thät. Agr. Chem. Vers. Stat., Provinz Schlesein, 1901–2, pp. 6–20*).—Experiments on sugar beets, potatoes, barley, and grass lands are reported. During the 3 years over which the experiments have extended the 2 potash salts gave about equally good results on sugar beets, the kainit being somewhat more profitable in dry seasons, the 40 per cent salt in wet seasons. In a wet year both salts reduced the yield of potatoes, but in dry years moderate applications of either salt increased the yield sufficiently in most cases to overbalance the depressions in starch content which uniformly resulted from the application of the salts. In dry years the kainit gave best results on barley. The results on grass lands were inconclusive, although on dry lands and in dry seasons kainit apparently gave best returns.

On further results of the comparative fertilizer experiments with kainit and 40 per cent potash salt, W. Schneidewind (*Jahrb. Deut. Landw. Gesell., 17 (1902), pp. 30–33*).—A general discussion of this subject, which is more fully presented elsewhere (E. S. R., 14, p. 22).

Arrangements for irrigation and fertilizing on the royal domain of Grafenwerth on the Rhine, R. Schroer (*Deut. Landw. Presse, 30 (1903), No. 1, p. 3, figs. 5*).

Fertilizer department, B. E. McLin and R. E. Rose (*Rpt. Comr. Agr. Florida, 1901 and 1902, pp. 104–112, App., pp. 1–70*).—An account is given of the conduct and results of the fertilizer inspection in the State, with analyses of a large number of samples of fertilizers.

Fifth biennial report of the Missouri Agricultural Experiment Station on the enforcement of the fertilizer-control law, H. J. Waters (*Missouri Sta. Circ. of Information 16, pp. 16*).—A statement of receipts and disbursements, with analyses and valuations of 134 samples of fertilizers examined during 1901.

FIELD CROPS.

Field experiments at Lauchstädt, W. Schneidewind, D. Meyer, and W. Gröbler (*Landw. Jahrb., 31 (1902), No. 5–6, pp. 826–908, 963–968*).—The results of fertilizer and variety tests from 1898 to 1901, inclusive, are reported at some length.

Maximum yields of root crops were obtained only when barnyard manure was applied in conjunction with commercial fertilizers. This result is attributed to the mechanical effect of barnyard manure on the soil which favors the growth of plants and a consequent greater utilization of plant food. Although a very heavy application of nitrate of soda was made the quantity of nitrogen taken up by the plants was increased when barnyard manure was applied in addition to the nitrate. A heavy application of barnyard manure alone gave higher yields of turnips and potatoes than a heavy application of nitrogen, phosphoric acid, and potash in the form of commercial fertilizers. It was observed that a quantity of nitrogen taken up from barnyard manure produced more substance than an equal quantity taken up from nitrate of soda. The nitrogen from nitrate of soda enters largely into the production of the leaf and is used in this connection to a greater extent than the nitrogen from barnyard manure. From the average results of these tests, the returns from 100 kg. of deep stall manure and barnyard manure for turnips and potatoes, taking its residual effect on a succeeding crop of barley or wheat into consideration, varied from 29 to 35 cts. with stall manure and from 22½ to 27 cts. with barnyard manure. The variation with each was due to differences in the price of turnips and potatoes.

Deep stall manure gave larger yields than barnyard manure, but the differences were not in proportion to its larger quantity of readily soluble nitrogen compounds. Attention is called to the fact that the losses from deep stall manure when spread upon the field were greater than from barnyard manure which has already sustained considerable losses before its application, and that hence deep stall manure is more economically applied in quantities not furnishing more nitrogen than is taken up by the growing crop. In an experiment where 40,000 kg. of deep stall and barnyard manure were applied in connection with growing sugar beets, followed by barley in rotation, the nitrogen used by the crops was on an average 26.7 per cent of the quantity furnished in the deep stall manure and 23.8 per cent of the quantity given in the manure taken from the barnyard. The authors believe that with a lighter application a larger percentage of the nitrogen in the deep stall manure would have been utilized.

In another series of experiments it was found that liquid manure or nitrate of soda gave a larger increase in yield on soil poor in nitrogen when applied alone than when used with either a mixture of fresh manure and straw or with straw alone. When liquid manure or nitrate was applied alone a larger percentage of the nitrogen furnished was recovered in the crop than in the other case. This is explained by reference to the fact that fresh organic substances, such as the manure and the straw in this case, serve as a food material for certain soil bacteria and withdraw the nitrogen, which is in the form of nitrates, ammonia, and amids, from the use of the plants. This action necessarily results in a diminished yield on soils not containing an adequate amount of available nitrogen. These experiments were conducted in the first place with mustard, a very quickly growing plant, but later the same results, though not so marked, were obtained with cereals. The residual effect of the manure for the second and third years was only slightly favorable, while straw still had a detrimental effect the second and gave but a very slight increase in yield the third year. Fresh manure and straw did not decrease the yield on soils which furnished sufficient nitrogen for both the growing crop and the denitrifying bacteria which live on the undecomposed material. It sometimes occurs that when nitrogen is plentiful the use of fresh manure and straw increases the yield through its beneficial mechanical effect on the soil. It was also found that plants will take up as much nitrogen from nitrate of soda applied with barnyard manure, especially if well rotted, as when the nitrate is given alone, because the denitrifying organisms use the nitrogen compounds already formed in the manure. The authors conclude that the best yields of root crops are obtained when barnyard manure is used, but these results are not contradictory to the foregoing, because in these tests a surplus of available nitrogen existed in the soil and the barnyard manure used was not fresh. However, if the nitrogen supply of the soil had not been sufficient, then the use of fresh manure would also have been detrimental to roots.

Among different green manures a mixture of beans, peas, and vetches was most effective. The seed of this mixture, consisting of 50 per cent of beans, and 25 per cent each of peas and vetches, was sown after early barley or with winter oats at the rate of 250 kg. per hectare. The average annual financial returns per hectare from this method of green manuring amounted to $15. The quality of sugar beets was slightly lowered by green manuring. All nitrogenous fertilizers tend to lower the quality of beets and potatoes, but this loss is said to be largely outweighed by the increase in yield, provided the application is not too heavy.

A number of check plats which received no nitrogen gave good returns and showed no decrease in yields during the several years the experiments were in progress. This result shows that the soil conditions did not allow heavy applications of nitrogen. On sugar beet and potato plats, fertilized at the rate of 2 cwt. each of nitrate of soda and 200 cwt. and 133 cwt. of barnyard manure, respectively, ½ of the nitrate was applied at a loss. In experiments with wheat on plats of this same kind of soil which had not received barnyard manure for 2 years, only ½ and ⅔ cwt. of sulphate of ammonia per morgen (about 0.6 acre), applied in the fall and spring, respectively, was profitable. Where the preceding crop of potatoes had received barnyard manure only ½ cwt. in the spring in addition to the ½ cwt. given in the fall gave a profitable return. Barley on this soil without barnyard manure for 2 years used only from ½ to ¾ cwt. of ammonia per morgen with profit. It was found that where the preceding crop of beets had received barnyard manure, barley needed no application of nitrogen.

The use of phosphoric acid was necessary in all cases. An application of 20 to 25 lbs. per morgen for cereals and of 25 to 30 lbs. for root crops is considered adequate.

The results of the tests indicate that heavier applications would not be profitable. Superphosphate gave better results than Thomas slag. The sugar content of beets and the starch content of potatoes was not increased by fertilizing with phosphoric acid.

Owing to the large amounts of potash given the soil in barnyard manure, potash salts were not profitable for either cereals or root crops when applied with barnyard manure. Potash had no detrimental effect on the quality of sugar beets, but it lowered the starch content of potatoes. On the soil in question 40 per cent potash salt is considered preferable to kainit and the following quantities per morgen are recommended: Sugar beets 1.5 cwt., potatoes 1 cwt., and cereals 0.75 cwt. The use of potash every year did not seem advisable.

Variety tests with square head wheats show the best yields from Beseler Square Head No. 3. Among other varieties the wheat known as "Salischer Sandweizen" gave the largest yield. This variety also proved richest in protein and best for bread making of all the varieties grown. Hanna barley stood first among spring varieties and Bestehorn Giant Winter barley among winter varieties. Eckendorfer Mammut was the earliest variety of barley under experiment. Beseler No. 1 and No. 2 were the best yielding varieties of oats.

The average yield of dry matter in field beets for a series of years amounted to 9,900 kg. per hectare, while sugar beets, given high fertilizer applications, yielded 12,000 kg. In 1901, however, field beets and sugar beets yielded about equal quantities of dry matter. It is stated that 20 lbs. of sugar beets furnish about the same quantity of nutritive material as 50 lbs. of field beets. Owing to their low moisture content sugar beets keep much better in storage than field beets. The nutritive value of the dry matter in either variety is determined by the sugar content.

Extensive tables are given showing the composition of the crops under test and the quantities of plant food they withdrew from the soil.

Fertilizer experiments on meadows, EDLER (*Deut. Landw. Presse, 30 (1903), No. 16, p. 128, figs. 4*).—Thirty-one cooperative tests with kainit, Thomas slag, and nitrate of soda as fertilizers for meadows are reported. The different fertilizers were applied alone and in different combinations at the rate of 1,000, 800, and 100 kg. per hectare, respectively. The combined use of the fertilizers gave the best results, and the author concludes that the application of nitrogen in addition to potash and phosphoric acid on meadows is more profitable than is generally supposed.

Kainit and 40 per cent potash salts as fertilizers for cereals, H. BACHMANN (*Deut. Landw. Presse, 30 (1903), No. 15, p. 120*).—The results of cooperative fertilizer experiments are reported in tabular form. The use of 40 per cent potash salts applied in the spring gave a larger increase in the yield of oats and a smaller increase in the yield of straw than kainit. Lime given in connection with these potash salts did not change the relation of the results. With sugar beets kainit applied in the fall was more effective than 40 per cent potash salt, but when the applications were made in the spring kainit was the less effective of the 2 fertilizers. Kainit gave the better financial returns and in all cases showed the greater residual effect.

Variety tests of barley and oats, C. FRUWIRTH (*Vergleichende Anbau-Versuche mit verschiedenen Gerste und Hafersorten. Plieningen: Friedrich Find, 1902, pp. 68*).—The varieties of barley under test included Trotha Chevalier, Hanna, Selchower, Princess, and Goldthorpe, and those of oats Albhafer, Duppauer, Sechsaemter, Heine Ertragreichster, Heine Trauben, Beseler, and Carter Golden. Each variety is described at some length, together with the results obtained in the experiments. The experiments extended over a period of 3 years.

Studies of Bohemian varieties of barley, O. KAMBERSKÝ (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 1, pp. 1–21, pls. 2*).—The results of studies in this line by various investigators are reviewed and 80 different varieties and forms of barley grown in Bohemia are classified under botanically recognized species and varieties. The different kinds are described and compared.

Bermuda grass, J. Fields (*Oklahoma Sta. Bul. 55, pp. 11, figs. 3*).—A brief popular bulletin on Bermuda grass in Oklahoma. A description of the grass and its culture is given and the experience of a number of experiment stations and of farmers throughout Oklahoma, who have tested it, is noted. "Of all the grasses tried on the station farm, Bermuda alone has shown the qualities which must be possessed by a pasture grass in Oklahoma. . . . It should be started only on lawns or on land intended for permanent pasture and should be kept out of fields intended for cultivation."

Bermuda grass, J. S. Newman (*South Carolina Sta. Bul. 76, pp. 6*).—A brief popular bulletin on the culture of Bermuda grass. A description of the plant is given and notes on its artificial propagation, the protection of the young plants from shade, and the method of destroying the sod are presented.

Improvement of red clover, M. Fischer (*Fühling's Landw. Ztg., 52 (1903), No. 2, pp. 55–59*).—The author reviews the results of experiments in the improvement of red clover conducted by himself and others, and concludes that for the purpose of shortening the growing period selection of yellow seed from early maturing dark green plants with many dark red inflorescences should be made. In order to increase the size of the plant it is recommended that the seeds of an intense violet color from slowly developing light green plants with comparatively few heads light red in color be selected.

Corn culture, R. J. Redding (*Georgia Sta. Bul. 58, pp. 197–218*).—Experiments here described are in continuation of work previously noted (E. S. R., 14, p. 842). Meteorological data for the year and the growing season are given in tables, and notes on the use of fertilizers in corn culture are appended.

Among 13 varieties tested in 1892 the most prolific were Bradberry Improved, Marlboro, and Sander Improved, yielding 12.95, 12.86, and 12.66 bu. per acre, respectively. The least productive variety, Allen Big White, yielded only 3.60 bu. per acre. Owing to a rather poor soil and a dry season the yields were low. A test of early varieties was made on more fertile soil, and the results obtained are judged more reliable than those in the experiment just described. In this test the yields ranged from 26.84 to 35.51 bu. per acre with Marlboro Prolific, Weekley Improved, and Cocke Prolific in the order given leading in productiveness.

A comparison of planting corn on the beds and in the water furrow resulted in favor of the beds, although the season was very dry. These results and those of previous years indicate that it is not advisable to plant in the water furrow. Thorough preparation of the soil as compared with ordinary preparation gave an increase in yield of only 1.16 bu. per acre, which was hardly enough to pay for the extra work. Experiments in cultivation during this dry season showed that the yield increased in proportion to the frequency of cultivation. Cultivating every week in the dry season is considered better than cultivating thrice in succession every 3 weeks or twice every 2 weeks.

Fertilizer tests were made with the different applications of uniform cost, but the drought prevented the utilization of the fertilizers applied. Attention is called to the financial risk of using fertilizers when the crop is grown on dry uplands.

Methods of corn breeding, C. G. Hopkins (*Illinois Sta. Bul. 82, pp. 525–539, figs. 2*).—This has been noted from another source (E. S. R., 14, p. 321).

Cotton, A. Oppel (*Die Baumwolle. Leipzig: Duncker & Humblot, 1902, pp. 745, figs. 236*).—This work gives the history of cotton, describes the cotton plant and its culture, and discusses the uses of the fiber, the by-products of the plant, and the relation of cotton culture to commerce and economic conditions. In addition the cotton industry in each cotton-growing country of the world is treated separately. An extensive bibliography on cotton is given.

Experiments with hemp, V. V. Viner (*Khozyaĭne, 1901, No. 47–48; rev. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 3 (1902), No. 2, pp. 248, 249*).—Fertilizer, variety, and seeding tests with hemp are reported. The results of the fertilizer experiments indicated that phosphoric acid was the only element capable of producing a marked improvement in the growth. Nitrogen stood second in effectiveness and potash last. It is said that the plant food requirements of hemp resemble those of the grasses, with the exception that hemp prefers nitrogen to potash. The average crops from plats without fertilizers with applications of phosphoric acid, potash, and nitrogen alone, and with a combined application of the 3 elements, bore the same relation to each other as 178, 236, 164, 203, and 268, respectively. Phosphoric acid equally affected the formation of stems, fiber, and seed. Potash mainly improved the yield of seed, and nitrogen increased the yield of fiber. The results further showed that hemp readily assimilates the phosphoric acid from bone meal.

From observations in connection with the seeding experiments it is concluded that on poor soils the crop should be thickly sown.—P. FIREMAN.

Novel system of potato production (*Gardening, 11 (1903), No. 252, p. 183, figs. 2*).—An account is given of securing new potatoes from old seed left in caves at the end of the year. The old potatoes were placed in one end of a dark cellar on the ground and partially covered over with sifted sand. In this position they produced a large number of small tubers, but scarcely any leaves or stems. By a proper succession of layering, young potatoes were gathered throughout the autumn and winter.

Rape as a forage crop, A. S. Hitchcock (*U. S. Dept. Agr., Farmers' Bul. 164, pp. 16, fig. 1*).—This bulletin gives a description of rape and the varieties which have come into prominence; outlines the value of the plant for feeding purposes and its uses as a catch crop, weed destroyer, vegetable, and cover crop; and discusses in a general way the culture of the crop, with notes on soil requirements and preparation, seeding, cultivation, and harvesting. Brief notes on rape growing in several States are also presented.

Culture and composition of rice, G. d'Utra (*Bol. Agr. São Paulo, 3. ser., 1902, No. 9, pp. 571–583*).—A general discussion on the culture of the crop is given, and the results of analyses of samples of rice grown in different localities in southern Brazil are shown in tables.

Root crops in Montana, R. S. Shaw (*Montana Sta. Bul. 40, pp. 20*).—This bulletin gives popular descriptions of the culture of sugar beets, mangels, carrots, turnips, and potatoes under Montana conditions. In addition to treating each crop individually a general discussion on growing root crops, including notes, are given on soil preparation, seeding, harvesting, and storing. The bulletin also gives directions for the preparation of the seed and for treatment to prevent scab.

Sugar beets, F. W. Traphagen (*Montana Sta. Bul. 41, pp. 8*).—The results of analyses of sugar beets grown by farmers in cooperation with the station in 1902 are briefly presented. The number of samples is considered insufficient for drawing general conclusions. The richest sample contained 24 per cent of sugar in the juice. Results for several years have indicated that the sugar-manufacturing campaign in Montana could begin about the middle of September. This season excellent results were obtained, although very little water, and in some instances none, reached the crop during the growing season.

Sugar-beet speculation, A. B. Leckenby and R. Withycombe (*Eastern Oregon Sta. Bul. 1, pp. 11, figs. 10*).—The injuries resulting from boring sugar beets are discussed and illustrated. A study of these injurious effects was made by boring 2 mother beets and allowing them to grow with their centers thus destroyed. Two of the samples contained more than 22 per cent of sugar, but the season's growth after boring contained less than 10 per cent in one, while the other contained no sugar at all. All of the bored beets grew into highly distorted forms.

A table is given showing the quality of the beets selected according to certain leaf characters, and the author recommends such selection in the improvement of the beet.

A number of beets were divided into 6 concentric rings and each ring analyzed. The results show that the outer portions contained the least sugar, while the portion halfway between the center and the outer portion was richest.

Notes on the selection of seed beets are summarized as follows: "Select only those with flat tops, single crowns, smooth bulbs, good shoulders, growing well underground with short and firm leafstalks bearing flat yellowish green leaves, bulbs well supplied with feeding roots coming from well defined long dimples in cheek of beet and only those rich in sugar."

Late growth of sugar beets, A. G. DOYARENKO (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *3* (*1902*), *No. 4, pp. 516–518*).—Analyses of sugar beets harvested September 1, 10, 20, and 30 showed that the last sample harvested represented an increase in yield of 20.3 per cent and that the quality of the beets gradually deteriorated from the earlier to the later date of harvesting.—P. FIREMAN.

Experiments with sugar cane, J. B. HARRISON (*Rpt. Agr. Work Bot. Gard.* [*British Guiana*], *1896–1901, pp. 12–133*).—Results of variety and fertilizer experiments with sugar cane for the years 1896–1901 are reported. The detailed results are given at some length in tabular form.

The analyses and yields of old varieties of cane are given, and the record of each variety is briefly noted. The tests with seedling canes showed that the richness of the parent cane does not indicate the probable richness of the seedling or canes propagated from it by cuttings. In a few cases seedlings exhibited a tendency to approximate the sugar content of the parent plant. The percentage of non-sugars in the juice seemed also free from hereditary influences. The glucose ratio and in part the quotient of purity were governed by the degree of maturity. The size of individual canes did not seem to affect the size of the offspring, but the average size of the parent varieties closely governed the size of the seedlings. Although most seedlings from seed of seedling varieties showed deterioration, some gave considerable promise. The seeds from seedlings proved more fertile than those from old varieties. The seedlings from older varieties generally showed a marked tendency to variation, while in those from seedling varieties this tendency was not so obvious and many of them came fairly true to the parent cane. The variation in color, size, and sugar content was greater in the seedlings from striped canes than in those from self-colored canes.

Experiments with different fertilizers, including lime, were conducted on very heavy clay soils. The supply of nitrogen in the forms of sulphate of ammonia, nitrate of soda, raw guano, and dried blood mainly governed the increase in yield due to the use of fertilizers. When not more than 40 lbs. of nitrogen were applied per acre, sulphate of ammonia and nitrate of soda gave practically the same results, but in general the author considers the sulphate preferable. Dried blood and raw guano were inferior to each of these forms. In applications furnishing more than 40 lbs. of nitrogen per acre on alluvial soils sulphate of ammonia was the best nitrogenous fertilizer. The use of 200 lbs. of sulphate of ammonia or 250 lbs. of nitrate of soda per acre gave better results than heavier dressings. In general, dressings of from 200 to 300 lbs. of the sulphate seemed the most profitable applications of nitrogen.

The yield of plant canes was increased by the use of superphosphate of lime applied with nitrogen and potash. The effect of phosphates on rattoon crops was hardly perceptible, and the author recommends restricting the use of phosphates to plant canes and manuring rattoon crops with nitrogen only. Thomas slag gave better results than superphosphate of lime. Mineral phosphates proved unprofitable. Potash, either in the form of the sulphate or the nitrate, exerted little or no effect. Lime gave largely increased yields which seemed to be due mainly to the mechanical effect on the soil.

As in previous experiments the use of either phosphoric acid, potash, or lime in connection with other fertilizers did not have a favorable influence on the sugar content. Nitrogenous fertilizers retarded maturity and consequently reduced the sugar content, but this loss was more than offset by the increase in yield.

Sugar-cane culture (*New York: German Kali Works, pp. 68, figs. 19*).—This treatise is a popular outline of sugar-cane culture in different countries. In this connection climate, drainage, irrigation, varieties, seedlings, soils, and fertilizers are discussed, and the composition of sugar cane and of different materials used in fertilizing the soil for the culture of this crop is given.

Fertilizer experiments with tobacco in Deli, D. J. Hissink (*Meded. 'S. Lands Plantentuin, 1902, No. 60, pp. 171*).—Cooperative fertilizer experiments with tobacco were carried on in 1901, and the results are here reported at some length. On well-drained land and under favorable weather conditions the chlorin and sulphuric acid given in the fertilizer showed no detrimental effect. The results on sandy soils containing considerable humus indicate that in favorable seasons practically no fertilizers were necessary. A small quantity of nitrate given each individual plant when set out gave good returns. For clay soils the author especially recommends the use of nitrogen in nitrate form. Phosphoric acid was found to be very effective upon black, red, and clay soils. Although the tobacco plant contains but little phosphoric acid, the Deli soils were most in need of this element. A fertilizer containing 10 per cent each of potash and phosphoric acid is recommended for all soils. The nitrogen content of fertilizers for black and red soils, according to the author, should be from 4 to 5 per cent, and for clay soils 5 per cent, with 0.4 of the quantity in the nitrate form. In connection with 0.5 gm. of nitrogen and 0.75 gm. of phosphoric acid per plant from 1 to 2 gm. of potash gave the best results. Analyses of the soils on which the tests were made are tabulated.

Agricultural botanical report for 1901, J. Eriksson (*K. Landt. Akad. Handl. Tidskr., 41 (1902), No. 2, pp. 112–134*).—A report is given of investigations on the hardiness of different varieties of wheat grown at the experimental grounds of the Royal Academy of Sweden, upon investigations of cereal rusts, etc. Of the 146 varieties of winter wheat under observation from 1890 to 1901 the following foreign varieties attained the highest rank: Urtoba, Graf Walderdorffscher, Kaiser, and Grevenhagener.—F. W. WOLL.

Manual of tropical agriculture, H. A. A. Nicholls, trans. by H. Pittier (*Manual de agricultura tropical. San José, Costa Rica: Tipografía Nacional, 1901, pp. 244*).—The English edition has been previously noted (E. S. R., 13, p. 1105).

HORTICULTURE.

Vegetable gardening in the mountain glades, L. C. Corbett and K. C. Davis (*West Virginia Sta. Bul. 81, pp. 356–386, pls. 6*).—The mountain glades of West Virginia are described as depressions at high altitudes in the Allegheny Mountains, varying in extent from a few to several thousand acres, into which the rich soil from the surrounding elevations has been washed by mountain streams and rains. They are usually wet and rather level. The soil is a muck rich in organic matter with some fine silt and underlaid with clay at a depth of 15 to 18 in. In its natural state it is overgrown with alders and other bushes. When brought under cultivation it requires drainage and will produce good crops of hay, wheat, corn, and buckwheat without fertilizers.

The work here recorded consists of records of the yields obtained on these glade soils during 3 seasons with cabbage, onions, squashes, and celery. These crops were grown with lime, complete commercial fertilizers in varying proportions, and barnyard manure, respectively. Some plats were left unfertilized for controls. The barnyard manure was used only during the last 2 seasons. Complete cultural directions are included for all these crops. Good yields and vegetables of excellent quality were secured on all the differently treated plats each year of the experiment. Unusually large yields were obtained with cabbage, onions, and squashes, even when no fertilizers were used. The use of lime invariably resulted in increased yields over the control plats and in many instances gave as good or even better results than were obtained with commercial fertilizers. Of 23 varieties of cabbage grown Filderkraut, Louisville Drumhead, and Acme Flat Dutch gave the heaviest yields and proved desirable for both local and general market. Late cabbage appears to be more satisfactorily grown on these glade soils than earlier varieties.

With onions stable manure applied at the rate of 20 tons per acre resulted in the heaviest yields. The onions were grown continuously for the 3 seasons on the same plats, and the yields obtained the third season were considerably less than those obtained in either of the preceding years. Nothing was gained by seeding onions in a hotbed and transplanting to the open field over seeding in the field on the same date the seed was sown in the hotbed. The Southport strains of onions were found best suited to the cultural conditions of the glade lands. Southport White Globe was the best of the white varieties. Among the red onions the Red Weathersfield proved the most satisfactory in all respects. Philadelphia Silver Skin did not keep well.

In the culture of squashes the use of pieces of mosquito netting 18 in. square to place over the hills while the young plants were getting started is recommended as a protection against the striped cucumber beetle or squash bugs. A small wooden pin 6 in. in height is placed in the center of the hill, the netting thrown over it to form a tent, and the sides fastened down with dirt.

The results obtained with celery while the least satisfactory obtained with any of the vegetables grown, were nevertheless very good. Further work with this crop will be carried on.

Garden vegetables, O. M. Morris (*Oklahoma Sta. Bul. 56, pp. 14*).—The desirability of a garden on every farm is noted, and an account given of the culture, and in a number of cases of tests of varieties, of tomatoes, eggplants, onions, lettuce, radishes, salsify, beans, and peas.

As a result of the variety tests with tomatoes, extending now over a period of 3 years, the following varieties are recommended: Atlantic Prize, Beauty, Dwarf Aristocrat, Early Minnesota, Early Ruby, Favorite, Ignotum, Kansas Standard, Perfection, Ponderosa, Stone, and Trophy. All of these varieties are briefly described.

Only 3 varieties of eggplants have been successfuly grown at the station. These are Fordhook Improved Spineless, New York Large Purple, and White Pearl. All of these varieties require about 100 days to come to maturity. The White Pearl has been found most productive.

In the growing of onions it has been found cheaper to grow the crop from seed than to plant out sets. Starting the seed in a seed bed and transplanting has regularly resulted in poor crops, owing largely to the soil being too dry at the time of transplanting in the early spring. The best 6 varieties recommended for general planting in Oklahoma are Australian Brown, Giant Red Rocca, Michigan or Ohio Globe, Pink Prizetaker, Prizetaker, and Southport Red Globe.

At the station lettuce has been successfully grown only in early spring. In some seasons when there is plenty of rain in the fall a late crop can also be secured with but little trouble. The curly leaf lettuces seem to give better satisfaction as a class than the head varieties. Of the curly leaf sorts Grand Rapids, Early Curled Silesian, Black Seeded Simpson, and Simpson Early Curled are considered about the best varieties, and of the head-lettuce sorts Early Prize Head, Silver Ball, Paris White Cos, and New York.

The Valentine varieties of beans are considered desirable for green or snap beans;

Large White Marrow and White Kidney for dry beans; and Golden Wax, Dwarf Black Wax, and Refugee Wax the best among the wax or yellow podded beans.

Among the peas Tom Thumb, Little Gem, Telephone, and White Marrowfat are, respectively, recommended in their season.

Effect of acetylene gaslight on plant growth, F. W. Rane (*New Hampshire Sta. Tech. Bul. 4, pp. 8, figs. 7*).—The effect of acetylene gaslight on the growth of a number of vegetables in the greenhouse has been experimentally determined during parts of two seasons. The light was obtained from a 10-lb. Acetogen generator having a cluster of 8 burners and a large 20-in. reflector. In the first experiment the lights were turned on April 4 and allowed to run each night until May 1. It appeared to be more or less effective upon the growth of beets, spinach, and cress, but its influence was less evident upon peas, tomatoes, and potatoes. Lettuce grown under the light was a trifle taller and somewhat more tender.

In the next experiment the lights were started in the greenhouse on January 1 and ran each night until February 15. This time the lettuce under the light grew considerably taller and was more tender than that grown in darkness. Beans, parsley, radishes, and coleus were also a little taller and somewhat more slender under the light. Corn also grew taller under the light, but was more stocky and had a better color in the dark. Fourteen heads of lettuce grown under the light weighed but ¼ lb. more than 14 heads grown under like conditions except in darkness.

The general conclusions are drawn that "most plants tend toward a taller growth under the light. It is doubtful whether this light can be used in the greenhouse from an economic standpoint for growing plants alone. While its effect is marked in the dark days of winter, little difference seems to be shown at other seasons of the year, when there is more sunshine."

The utilization of mineral matter by grafted plants, L. Daniel and V. Thomas (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 13, pp. 509–512*).—The amount of a nutritive solution absorbed by 2 varieties of beans grown naturally and grafted on each other reciprocally have been determined experimentally. The results show that transpiration was much greater in the control plants than in the grafted plants. The control plants were also much more injuriously affected by chlorosis. The amount of nutritive material absorbed by the grafted plants was slightly less than in the control plants.

Radishes, parsnips, carrots, and salsify, E. S. Brown (*Amer. Gard., 24 (1903), No. 427, pp. 135–137, figs. 7*).—An account of variety tests of radishes, parsnips, carrots, and salsify on American Gardening trial grounds in 1902, with descriptive notes on the better varieties in each case.

Cabbages and cauliflowers (*Amer. Gard., 24 (1903), No. 429, pp. 166–168, figs. 4*).—An account of the culture of cabbages and cauliflowers at the American Gardening trial grounds, with descriptions of 10 varieties of cabbages and 5 of cauliflowers.

Celery, E. S. Brown (*Amer. Gard., 24 (1903), No. 428, pp. 152–154, figs. 5*).—An account of the growth of several varieties of celery in the American Gardening trial grounds, with brief descriptive and cultural notes on 15 varieties.

The Dutch brined vegetable industry, R. F. Crawford (*London: Bd. Agr., 1902, pp. 32, pls. 6, figs. 3*).—An account is given of the culture and pickling of onions, gherkins, and cauliflower in Holland, with notes on methods of cooperation among Dutch market gardeners, and an account of Dutch market gardening schools. The appendix contains the regulations governing some of the cooperative associations of market gardeners in Holland and a complete syllabus of the lectures at the horticultural and market garden school at Boskoop.

Silverskin onions are the ones used for pickling in Holland. These are grown on clay soil about 3 ft. above the level of the dikes. About 40 tons of cow dung per acre is used. The seed is sown at the rate of 56 lbs. per acre. The average crop is about 112 bu. In pickling the onions about 44 lbs. of salt is used to 330 lbs. of onions. Gherkins yield about 280 bu. per acre. Two crops of cauliflower are grown each season. From 4,500 to 5,000 plants are set per acre.

Vegetables containing iron, H. Kühl (*Pharm. Ztg., 46 (1901), p. 608; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 23, p. 1155*).—Spinach was grown in soil treated with freshly precipitated iron hydroxid. The crop was freed from soil by washing and dried, yielding 30 gm. of dry matter containing 0.372 gm. iron in the ash.

Tests of table beets and mangel-wurzels, E. S. Brown (*Amer. Gard., 24 (1903), No. 426, pp. 118, 119*).—An account of a test of varieties of table beets and mangel-wurzels, with descriptive notes on 7 of the former and 2 of the latter.

An experiment in ginseng culture, G. C. Butz (*Pennsylvania Sta. Bul. 62, pp. 14, pls. 2*).—In 1897 the author secured 138 2-year-old cultivated ginseng roots, 100 native plants, and 300 seeds. These were planted and the data obtained for the 5 years up to 1902 are recorded. The native roots planted were small, of many shapes, and varied from 3 to 15 years of age, as shown by wrinkles on the roots. The 2-year-old cultivated roots were obtained from a dealer in ginseng roots. They were slender and plump, resembling young parsnips, and measured from 4 to 7 in. in length. Having been taken from cultivated soil, they had preserved in a large part all of their rootlets and thus differed from the native roots, which had been broken to a considerable extent in digging.

A ginseng bed was prepared by adding about 3 in. of woods earth to a clay soil and spading thoroughly 10 in. deep. The roots were planted 8 in. apart each way, using a planter's dibble 10 in. long for the purpose. The top of the root was placed 2 in. below the surface of the soil. The seeds used were planted in shallow drills 1 in. apart and covered with an inch of fine soil. Artificial shade was afforded the plants by a lath screen nailed to a framework 6 ft. high.

The after care of the plants consisted in mulching the beds with forest leaves and brush upon the approach of winter and removing this in springtime. The soil was kept loose during the summer and weeds were removed by two or three hoeings. As the seed ripened it was harvested and stratified. All the roots were harvested in October, 1902. At that time it was found that there had been a loss during the 5 years of 14 per cent of the cultivated plants, 48 per cent of the native plants, and 91 per cent of the seedling plants. During the last 4 years of the experiment there had been harvested 11,447 seeds from the cultivated plants, 1,223 seeds from the native plants, and 989 seeds from the seedlings sown. "The number of seeds per seed-bearing plant in 1902 averaged 55 on the cultivated plants, 17 on native plants, and 30 on seedling plants."

The total yield of roots as dug was 14.8 lbs. of cultivated roots, 3.2 lbs. of native roots, and 1.8 lbs. of roots from the seedlings. The roots were then trimmed and washed and all the rootlets under the thickness of a slate pencil which would have dried into mere brittle hairs were removed. The total weights were then reduced to 12.6 lbs. of cultivated roots, 2.5 lbs. of native roots, and 1.3 lbs. of seedling roots. The roots were then dried by subjecting them to an artificial temperature of 100 to 120° F. using the heat from a steam radiator. It required 19 days to dry the roots in good shape. It is stated that the usual way of drying the roots is to spread them on trays or tables in the sun. This requires from 6 to 8 weeks. The cultivated roots as dried weighed 4.66 lbs. or 37.1 per cent of their original weight; the native roots weighed 0.84 lb. or 34.62 per cent of their original weight. The cultivated roots brought $8.50 per pound or a total of $43.03. The native roots sold for $6 per pound and brought $4.87.

Using the data obtained in this experiment, with the 138 cultivated plants grown on $\frac{1}{580}$ of an acre as a basis, the author estimates that the cost of growing an acre of ginseng 5 years would amount to $9,249, distributed as follows:

80,040 plants, at 10 cents	$8,004
Lath for screen roof, posts, boards for cross-bars and braces, setting posts, and carpentry	645
Planting, preparing soil, weeding and mulching for five years, digging roots, washing and drying crop	600

The receipts from an acre at the end of 5 years would be 2,900 lbs. of dried roots worth, at $8.50 per pound, $24,650. This gives a net profit in 5 years of $15,401, without taking into consideration interest on money invested, the cost or rental of the land, etc. The bulletin concludes with a brief account of the more common enemies of ginseng.

Ginseng; its cultivation, harvesting, marketing, and market value, with a short account of its history and botany, M. G. Kains (*New York: Orange Judd Co., 1903, n. ed., pp. 142, figs. 24*).—This is the second edition of this work, which has been enlarged to more than twice its former size and brought up to date. The increase in size is due largely to a discussion of the present status of the industry.

Notes from the trial grounds, E. S. Brown (*Amer. Gard., 24 (1903), No. 425, pp. 103, 104, figs. 2*).—Notes are given on the growth of varieties of muskmelons and watermelons at the American Gardening trial grounds in New York. Eleven varieties of muskmelons and 4 of watermelons are briefly described.

Practical suggestions for fruit growers, H. P. Gould (*U. S. Dept. Agr., Farmers' Bul. 161, pp. 28, figs. 8*).—This bulletin "is intended to be a practical presentation of principles rather than a description of methods." Such problems as location, soil, varieties, stock, pruning, fertilizing, tillage, cover crops, marketing, spraying, etc., are popularly discussed.

Peach growing in West Virginia, K. C. Davis (*West Virginia Sta. Bul. 82, pp. 389–441, pl. 1, figs. 21, maps 4*).—An account of the development and present status of the peach industry in West Virginia, including descriptions of the methods followed by the best peach growers of the State in setting out peach orchards, cultivating them, planting them with catch crops, thinning the fruit, combating insect and fungus pests, picking, packing, sorting, shipping, etc. Maps are given showing where peaches are now grown on a commercial scale within the State, where they have been successfully grown for home use, and the areas recommended for trial of peaches.

Some cooperative fertilizer experiments conducted by the station with commercial growers indicate that for Romney shales a complete fertilizer compounded in the proportion of 60 to 80 oz. of dissolved boneblack, 20 to 30 oz. of muriate of potash, and 20 to 30 oz. of nitrate of soda, and applied at the rate of 4 or 5 lbs. per tree for the first 5 years of the growth of the orchard, is likely to give very satisfactory results. Trees thus treated hold their leaves longer and fruit later than trees not fertilized. Applications containing 1 or 2 lbs. of muriate of potash, but omitting either the nitrate or the dissolved boneblack, did little or no good and in some cases were even harmful.

"More than 2 lbs. of potash per tree even killed the trees in several instances. Light applications of potash with some acid phosphate, in form of South Carolina rock or otherwise, produced the best colored fruit. Results indicate that the dates of ripening can be controlled to a limited extent by certain applications now being tested. When applied alone, bone meal gives better growth than dissolved bone. Thomas slag, while difficult to obtain, gives no better results than South Carolina rock."

As to the best varieties to plant, the following list, recommended by one of the oldest and largest peach growers of the State, is given:

(1) Southern Early; (2) Mountain Rose, Champion; (3) Oldmixon Free, Stump-the-World; (4) Reeves Favorite, Captain Ede; (5) Elberta; (6) Crawford Late, Fox Seedling; (7) Smock, Ford Late, Pickett Late; (8) Bonanza, Heath Cling, Leavy Late Cling; (9) Salway, and (10) Bilyeu. The varieties are noted in the order of their ripening, which in 1901 ranged from August 8 to October 19. Elberta is also mentioned as a great success, standing prolonged drought well and enduring a wet season.

An account is included of some trial shipments in 1901 of peaches and pears by one of the larger growers of the State to England. Five carriers of peaches and 3 of pears netted back to the growers $19.50. According to New York quotations at the time these same fruits in the New York market would have returned but $6.75, from which express, commission, cartage, etc., would have to be deducted.

The coloring matter and sugar of apricots, A. Desmoulière (*Ann. Chim. Analyt., 7 (1902), pp. 323, 324; abs. in Analyst, 27 (1902), No. 320, p. 325*).—According to the author's analyses, apricots which were not completely ripe contained 3.13 per cent saccharose, 2.38 per cent invert sugar, and 0.77 per cent dextrose. Similar values for the ripe fruit were 3.81, 2.30, and 0.35 per cent. From the apricots pounded with water a liquid was obtained containing a yellow coloring matter which could be extracted by an acid or alkaline solution of amyl alcohol. This coloring matter on the addition of a drop of sulphuric acid gave an indigo blue color changing to brownish violet, an action identical with that of carotin, the yellow coloring matter of the carrot.

Culture of the citrus in California, B. M. Lelong et al. (*Sacramento: State Bd. Hort., 1902, pp. 267, figs. 148*).—This work has been revised by the State Board of Horticulture to include present day methods of citrus culture in California.

The new method of curing lemons (*California Cult., 20 (1903), No. 5, p. 65, figs. 4*).—The author states that in the California orchard of the Limoneira Ranch Company all lemons are thoroughly washed as soon as they are picked. This adds greatly to the appearance of the fruit, and if done as soon as the fruit is picked does not injure its quality. The fruit is dried under cover and not in the sun. Illustrations are given of the washing machines and packing house.

Limes at Dominica (*Agr. News [Barbados], 2 (1903), No. 21, p. 37*).—Analyses of recently ripe fruits of the ordinary lime, a new spineless variety, and the Villa Franca or Sicily lemon, grown at the botanic station at Dominica, show the citric acid content of these varieties to be as follows: Ordinary lime, 13.22 oz. of citric acid per gallon; spineless lime, 13.8 oz.; and Sicily lemon, 11.05 oz. per gallon. The corresponding grains of citric acid per ounce of acid are as follows: 36.15, 37.73, and 30.22, respectively.

The formation of acid in lemons, E. Leuscher (*Ztschr. Oeffentl. Chem., 8 (1902), pp. 25–27; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 1, p. 30*).—The variety Eureka, in Jamaica, was found to weigh on an average 174 gm., and yield 78 cc. of juice containing 7.43 per cent of free citric acid.

Olive oil tests, W. J. Allen (*Agr. Gaz. New South Wales, 13 (1902), No. 12, pp. 1212, 1213, pls. 3*).—Tests have been made of a number of varieties of olives for oil production. Great differences were noticed between different varieties in the amount of oil furnished by the same quantity of fruit. Some varieties produced 8 to 10 times as much oil as other varieties. The proper selection of varieties, therefore, is a matter of considerable importance in oil production. The 2 varieties Correggiola and Pleureur were the best of a number of varieties tested and about equal in oil production. Next in order of merit were Boutillane, Pigale, and Dr. Fiaschi. Gros Redondeau was classed as a low-grade olive for oil production, while such varieties as Amellau, Bouquettier, Macrocarpa, Cucca, and Blanquette are not worth planting as oil producers. For both pickling and oil Correggiola and Pigale are recommended, though the latter proved a light bearer during the season of 1902. Another variety not included in the test, but which is considered a good cropper and a particularly good oil producer, is Hardy Mammoth. Data relative to the date of gathering, the oil produced, and the size of the crop are tabulated for 11 varieties of olives.

The banana, CAZARD (*Bul. Agr. Algérie et Tunisie, 9 (1903), No. 2, pp. 32-39*).—An account of the origin of the banana, methods of planting, manuring, irrigating, packing, etc.

Pineapple culture, I, A. H. BENSON (*Queensland Agr. Jour., 12 (1903), No. 2, pp. 123-127*).—The author states that so far as Australia is concerned the pineapple industry is practically confined to Queensland. The best fruits are grown in a climate in which the average annual temperature is under 70° and the average rainfall only 58 in. The most important pineapple district in Queensland is the Brisbane district, though good pines are produced in several other localities. The soils vary from a rich red or chocolate "scrub" to those poor, thin, and sandy. In the Brisbane district the soils are generally of a loamy nature. Directions are given for selecting the soil and site for pineapples.

Pineapples, cultivation, C. E. SMITH (*Agr. Jour. and Min. Rec. [Natal], 6 (1903), No. 3, pp. 83-89*).—An account of the culture of pineapples in Jamaica, including notes on the insects and diseases affecting the plants.

The mango in Porto Rico, G. N. COLLINS (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 28, pp. 38, pls. 15*).—This bulletin urges the culture of better varieties of mangoes in Porto Rico, more particularly in the drier parts of the island on the southern side. Mangoes are now grown in Porto Rico to a considerable extent, but it is claimed that all the varieties are of an inferior quality. Such varieties as are now grown there are briefly described, as well as 8 improved varieties which it is believed might be successfully introduced. Notes are given on the botany of the mango, its cultural requirements, methods of propagation, and cultivation. The uses of mangoes as a desert fruit and for canning, and in the production of marmalade, jelly, chutney, dyes, etc., are also noted, and some suggestions given regarding packing and shipping mangoes and the possibility of developing markets for the fruit in the United States.

The kumquats, H. H. HUME (*Florida Sta. Bul. 65, pp. 555-566, pls. 2*).—A brief history is given of these fruits, with an account of their culture in Florida and analyses of the ash of 2 varieties. According to the author, kumquats were introduced into England from China in 1846 and soon after reached America. The first trees in Florida were planted in 1885. The proper name of the kumquat is *Citrus japonica*. The kumquat is a much-branched shrub 8 to 12 ft. high, with rather close, compact branches. The flowers are sweet-scented like those of the orange, and the fruit round or oblong 1 to 1¼ in. in diameter. The juice of the fruit is acid, the rind has an agreeable spicy taste, while the inner portion of it is decidedly sweet.

Of the 2 varieties grown in Florida the Nagami is considered the more desirable, although there is some difference of opinion on this point. It is not as hardy, however, as the variety Marumi. Some measurements are given of the heights attained by these trees at Clearwater, Fla. These varied from 8 ft. 8 in. with the Marumi variety to 10 ft. 9 in. with the Nagami variety. The latter was 10 ft. 8 in. across the head.

As a stock on which to grow kumquats the author recommends *Citrus trifoliata* for northern Florida and sour orange or pomelo for the southern portion of the State. Rough lemon has been successfully used on soils not too wet. When kumquat buds have been inserted in sprouts from rough lemon roots, which already support and feed a sweet or mandarin orange top, a perfectly healthy union has been secured.

The kumquat is considered hardier than most citrus fruits, withstanding almost or quite as much cold as the Satsuma. It is recommended for planting in northern Florida. The trees should be set 8 to 12 ft. apart each way or in rows about 12 ft. apart and the trees 5 ft. apart in the row. The kumquat is considered an especially useful of the plant is the means of distribution of the trouble, and examination showed the presence of oxidizing ferments in the branches and cortex. Upon testing a number of diseased specimens the oxidase was found present in a soluble condition in all the diseased material but not in healthy trees. The conclusion is reached that the infection takes place below the ground, and whether other species of Stereum are capable of causing the disease is to be a subject of future investigation.

The olive knot in California, J. Isaac (*California Bd. Hort. Rpt. 1901–2, pp. 66–76, figs. 3*).—The olive knot is said to be one of the most serious diseases of the olive tree, and although long known in Europe it did not make its appearance in California until 1893. The outbreak of disease noticed at this time was checked by the rooting out and burning of all diseased trees, and the disease was believed to be under control when a second and more serious outbreak was reported early in 1901. The disease, which is of bacterial nature and is due to *Bacillus oleæ*, is described at considerable length, frequent quotations being drawn from Italian and other investigators regarding the nature of the disease and its remedies. At present the olive knot is confined to a comparatively limited area and does not appear to be spreading, the diseased trees being destroyed as soon as observed. This method of treatment is believed to be the most efficient remedy. No varieties seem to be immune, although the Mission olive appears more resistant than any other. Whatever stimulates the growth of the tree appears to favor the spread of the disease, and where irrigation is practiced the appearance of disease can be controlled to a considerable extent by withholding water.

The fumagin of olives, E. Zacharewicz (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 4, pp. 110–113*).—A description is given of the fumagin, as well as of a second disease caused by the fungus *Cycloconium oleaginum*, which may be recognized by the presence on the leaves of black splotches which gradually spread, their centers and borders being differently marked. The infested leaves after a time turn yellow and fall from the trees. For the prevention of the attacks of these fungi the author recommends spraying the trees with a mixture composed of soap 1 kg., kerosene 4 liters, copper sulphate 1 kg., and water 100 liters. This should be sprayed over the trees, the first application about the middle of April to be followed by the second in a month or six weeks. In addition to describing these diseases, the author gives suggestions regarding the cultivation of the olive and the handling of its products.

Concerning the gooseberry mildew, P. Magnus (*Separate from Gartenflora, 51 (1902), pp. 3; abs. in Centbl. Bakt. u. Par., 2. Abt., 9 (1902), No. 19, p. 729*).—A discussion is given of the distribution of *Sphærotheca mors uvæ*. The author takes exception to the statement of others that this mildew is identical with *S. tomentosa*, which occurs on various species of Euphorbia. The mildews of the Euphorbia are said to be quite common throughout Germany in regions where the gooseberry mildew has never been known.

The gooseberry mildew in Russia, P. Hennings (*Ztschr. Pflanzenkrank., 12 (1902), No. 1–2, pp. 16, 17*).—The occurrence of the gooseberry mildew (*Sphærotheca mors uvæ*) in different localities has led to a more extensive study of its distribution, and it is reported as occurring in different parts of Russia. The author believes that it is in all probability endemic to that country.

Oidium and early pruning, G. Darragon (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 4, pp. 121, 122*).—Notes are given on the effect of early pruning for the prevention of powdery mildew. Vineyards that were pruned early in the winter and sprayed during the summer did not suffer from attacks of mildew, but those pruned late, even though frequently sprayed, were more or less subject to injury.

Report on a trip to Jamaica, F. S. Earle (*Jour. New York Bot. Gard., 4 (1903), No. 37, pp. 1–10*).—At the request of the director of the Jamaica Public Gardens the author made a visit to that island and presents some brief preliminary notes on a number of diseases of economic importance. Among the diseases noted are logwood rot, cocoanut diseases, banana leaf blight, orange root grub, and several diseases of cacao.

The logwood root rot is said to be affecting the logwood trees, especially on the western end of the island, causing the destruction of many specimens. The diseased trees usually occur in groups, infection spreading slowly in constantly widening circles. The tissues are invaded by a white fungus mycelium, which seems to first attack the small rootlets, gradually spreading to the larger roots and finally to the crown, when the tree dies. The fungus causing this is probably one of the Hymenomycetes, and for the control of the disease the author recommends digging out and burning the roots of dead trees, or where a considerable area is infested, clearing the tract entirely of logwood and growing some crop that is not subject to the attack of this fungus.

Notes are also given on what is termed in the trade "bastard" logwood. This is a kind of logwood which contains little or no hæmatoxylin, but in its place a substance yielding a dull, yellowish-green dye. From various facts observed by the author it is believed that this is probably due to some hereditary trait on the part of the plant, as only certain trees produce this form of wood, and they apparently are reproduced from seed. Considerable variation has been noted in specimens of logwood and it is thought probable that there may be a varietal difference.

Among the diseases of cocoanut a description is given of a bud disease in which the first symptom is the dropping of the immature nuts. The head of the tree is in all cases invaded by what seems to be a bacterial rot, and bacteria are believed to be the cause of the trouble. It is claimed by some planters that a green-skinned variety of cocoanut is less liable to this disease than others, and facts observed seem to support this view. A second disease is reported in which the nuts fall a few at a time, the lower leaves droop and fall prematurely, and in the final stages the leaves are less than half normal size and are borne at the apex of the nearly bare stem. The course of this disease is always slow, but the affected trees ultimately die. In all the trees examined a white scale insect was always found at the base of the petioles and on the fruiting peduncles, but these insects did not seem to be numerous enough to account for the serious effect produced on the tree. It is said that badly affected trees have recovered when subjected to a firing of the dead leaves and fibers hanging on the trees. The flames kill all the fruit and open flowers as well as most of the expanded leaves, but the apical buds are not injured and new leaves and flowers soon develop. The work of the cocoanut trunk borer and the trunk rot, which are perhaps somewhat related, is described.

A banana leaf blight, which causes the browning of the vascular bundles in the veins and midribs of the leaves and eventually the decay of the leaf, is described. The infected plants are commonly stunted in growth and do not bear fruit, and there seems to be evidence that the disease is contagious. It is believed to be of bacterial origin and so far is confined to one locality.

The work of the orange root grub (*Prepodes vittata*) is described, the grub gnawing the roots and ultimately destroying the trees.

Among the cacao diseases mentioned is a stem canker, which is probably due to some form of Nectria, as the yellow perithecia were found abundantly developed on the bark. It is believed that painting the cankers and spraying the trees with Bordeaux mixture would protect the trees against this disease. A cacao pod rot, which is apparently of fungus origin, is briefly mentioned. It has as yet not attracted much attention, but is liable to prove destructive, particularly with certain varieties grown at low altitudes. A root disease, somewhat similar to that mentioned above as affecting the orange, is also noted.

A root rot of cassava was observed, in which the plants were somewhat similarly affected as the logwood trees described above. The cassava had been planted on lands from which logwood trees had been cut, and it is possible that some relation exists between the root rots of these two plants.

Fungus cultures in the tropics, C. Holtermann (*Ann. Bot. Gard., Peradeniya, 1 (1901), pp. 27, pl. 1; abs. in Bot. Centbl., 90 (1902), No. 8, pp. 207, 208*).—It is stated that the excreted gum of the sugar palms (*Arenga saccharifera* and *Caryota urens*) when diluted in water and properly sterilized proves excellent media for the cultivation of different genera of fungi. It is further observed that the germinating spores of *Hemileia vastatrix*, the fungus which causes the destructive coffee leaf disease, showed that the hyphæ never possess transverse walls. This fact the author considers as indicating that the fungus does not belong to the Uredinæ, where it has been previously classed.

Comparative investigations of certain germicides, G. Wesenburg (*Centbl. Bakt. u. Par., 2. Abt., 8 (1902), No. 20, pp. 627-638; abs. in Jour. Roy. Micros. Soc. [London], 1902, No. 4, p. 472*).—A series of experiments was conducted to test the relative value of a number of substances which are offered for sale as fungicides. Antigermin was found to be a copper salt compound, with some weak organic acid. It is odorless, of a greenish color, and requires about 200 parts of hot water to completely effect solution. Mikrosol is a greenish paste of some copper compound. Afral is an organic compound, probably a nitro product of phenol. Antiformin is a chlorin compound similar to eau de Javelle. The effect of these various fungicides was tested on *Oidium lactis*, *Penicillium glaucum*, dry rot of timber, etc., and Antigermin was found to be the best preventive against the attacks of the dry rot, and it and Mikrosol were almost equally effective in destroying yeasts and molds. The other fungicides were found to be much weaker in their action.

The copper content of fungicides, with special reference to the copper poisoning of soils, K. Sajo (*Prometheus, 14 (1902), No. 685, pp. 129–132*).—The author discusses the composition of Bordeaux mixture, soda-Bordeaux mixture, eau celeste, etc., with special reference to the possibility of their injurious effects on soils when applied to plants for a long series of years.

Plant pathology, E. Rostrup (*Plantepatologi. Copenhagen, 1902, pp. 640, figs. 259*).

ENTOMOLOGY.

Insects of the year (*California Bd. Hort. Rpt. 1901–2, pp. 89–172, figs. 72*).—*South African black-scale parasite (Scutellista cyanea) A. Craw* (pp. 91, 92).—This parasite was imported from Cape Colony and has become established in California. Observations thus far made upon this insect indicate that it is an exceedingly effective agent in the destruction of the black scale.

California peach-root borer, E. M. Ehrhorn (pp. 93–102).—Notes are given on the appearance of the insect in its various stages and on its life history and habits. The methods recommended for destroying this species are digging out, the use of carbon bisulphid, strong washes, tobacco, gas lime, paper and other barriers around the trees, and a mixture of lime, coal tar, and whale-oil soap. The last named remedy is said to give the best results.

Insects as distributors of human diseases (pp. 103–114).—A brief discussion of the agency of mosquitoes and other insects in the transmission of malaria, typhoid fever, yellow fever, etc.

Locusts (pp. 115–125).—A number of species of locusts are annually injurious in California and occasionally certain species become unusually abundant. Notes are given on the life history of these insects and on the natural enemies and artificial remedies for their control.

Plant lice (pp. 126–137).—Economic and biological notes on woolly aphis, cabbage louse, wheat aphis, hop louse, black peach aphis, and cherry aphis.

Army worm (pp. 138–146).—Notes on the habits, life history, and means of combating *Leucania unipuncta.*

Cankerworm (pp. 147–150).—Brief notes on the spring and fall cankerworm. Paris green is recommended as the most efficient remedy for destroying this insect.

Screw-worm fly (pp. 151–153).—This insect was exceedingly injurious in the San Joaquin Valley 2 years ago. Recently, however, it has nearly disappeared, apparently on account of the unusually cold winter just experienced.

Notes are also presented on codling moth traps, a jumping gall, and on the collection and preservation of insects.

Horticultural quarantine reports, A. Craw (*California Bd. Hort. Rpt. 1901–2, pp. 187–204*).—Detailed notes are given on the injurious insects detected in fruit and other material imported into California and on various measures which have been taken for controlling insect pests in this State. A number of colonies of *Vedalia cardinalis* have been sent to various parts of the world for the purpose of destroying scale insects. The parasite of the black scale received from Cape Colony is reported as in good condition and apparently destroying the scale at a rapid rate.

Proceedings of the Entomological Society of Washington (*Proc. Ent. Soc. Washington, 5 (1903), No. 2, pp. 93–166, figs. 21*).—As usual, notes are given on the discussions and resolutions at the various meetings of the society during the year. A number of special articles were read, and these are printed in the present number of the proceedings. Some of these articles are of economic importance, while others are merely of scientific interest. Special mention may be made in this connection of the following articles:

Note on a California fruit worm, H. G. Dyar (p. 104).—This insect was found infesting dried fruit and proved to be *Vitula serratilineella.*

Observations on the habits of two Cicindelidæ, J. D. Mitchell (pp. 108–110).—These insects are *Tetracha carolina* and *Cicindela rectilatera.*

Collecting notes on mosquitoes in oriental countries, C. L. Marlatt (pp. 111–123).—Biological and economic notes are given on the mosquitoes of Japan, China, Java, and Ceylon.

Notes on the periodical cicada in the District of Columbia in 1902, C. L. Marlatt (pp. 124–126).—It is stated that in the City of Washington very few of the cicadas which emerged survived for more than 2 hours, being quickly destroyed by the English sparrows.

Synopsis of the North American species of Erebia, and *The life history of Callizzia amorata, H. G. Dyar* (pp. 129–133). *A chalcidid parasite of the Asiatic ladybird, C. L. Marlatt* (pp. 138, 139). *Notes on mosquitoes in New Hampshire, H. G. Dyar* (pp. 140–148). *Some new or unreported Orthoptera from Arizona, A. N. Caudell* (pp. 162–166).

Report on injurious insects in Finland for the year 1901, E. Reuter (*Landbr. Styr. Meddel.* [*Helsingfors*], *1902, No. 39, pp. 74*).—The larger part of this report is occupied with an account of the insects which are injurious to grasses and cereals, especially the insects which produce silver-top condition in these plants. An account is given of the extent to which silver-top condition prevailed in various parts of Finland during the year and of the insects which were chiefly instrumental in causing this damage. A large number of insects produce this effect, chief among which the author mentions species of Lasioptera, Pseudococcus, Isosoma, *Pediculoides graminum, Tarsonemus culmicolus, Aptinothrips rufa,* and *Eriophyes cornutus.* The amount of damage caused by these insects upon various species of meadow grasses is shown in tables, and an alphabetical list of species of grasses is given, together with the species of insects injurious to each grass.

A brief catalogue is also presented of the insects which cause silver top in grasses, arranged in a systematic order. For the purpose of preventing the injuries thus caused to grasses the author recommends immediate harvesting of the grass as soon as the damage begins to appear, and subsequent treatment by removal from the field and by other methods so as to prevent the undue spread of the insects. The species which were found to be specially injurious to cereals were *Phyllotreta vittula*, *Rhizoglyphus echinopus*, *Oscinis frit*, *Oiceoptoma opaca*, etc. Notes are also given on insects which were most conspicuous as enemies of garden crops, fruit trees, and ornamentals. Brief notes are given on injuries from ants.

Report of the State entomologist for 1901, S. Lampa (*Ent. Tidskr., 23 (1902), No. 2–3, pp. 65–116, figs. 6*).—As usual in these reports, the author presents an account of the insect injuries to various crops in different parts of Sweden, together with special notes on insects of unusual importance. In the present report notes are given on a large number of injurious insects, including gypsy moth, nun, diamondback moth, cabbage butterfly, blister beetles, cutworms, *Agriotes lineatus*, *Melolontha vulgaris*, pea weevil, bean weevil, *Apion apricans*, *Tomicus dispar*, codling moth, *Argyresthia conjugella*, etc. Notes are also presented on experiments in spraying various crops with Paris green and pyrethrum.

Report on the work of the section of plant protection from April 1, 1901, to March 31, 1902, C. Brick (*Sta. Pflanzenschutz, Hamburg, 4 (1901–2), pp. 1–10*).—The number of packages of apples introduced from America during the year was 30,684. Of this number, 4,095 were infected with San José scale. The percentage of infested fruit varied greatly according to the part of the United States from which they came, 8.96 per cent of the apples from the Eastern States, 25.72 per cent of those from California, and 99.55 per cent of those from Oregon being infested. The San José scale and other scale insects were also found to a slight extent on other fruits from North and South America. No specimens of San José scale were found upon living plants or parts of plants introduced from the United States.

Notes on certain injurious insects, A. Hempel (*Bol. Agr. São Paulo, 3. ser., 1902, No. 4, pp. 237–255*).—The author presents an analytical table for identifying the various groups belonging to Hemiptera and Homoptera. Special attention is given to biological and economic notes on injurious plant lice and scale insects. The insecticides most strongly recommended for destroying these insects include kerosene emulsion, sheep dip, and carbon bisulphid.

The changa, or mole cricket (Scapteriscus didactylus), in Porto Rico, O. W. Barrett (*Porto Rico Sta. Bul. 2, pp. 20, fig. 1*).—This insect is described in its various stages and notes are given on its life history, habits, and the most approved means for combating it. The eggs are laid in the underground galleries of the insect from a few inches to a foot or more beneath the surface of the ground. The eggs are deposited from January to March and hatch in about 2 weeks. The immature changa seldom leaves the soil, but adults are frequently seen, especially at night. The adult males may be readily attracted to lights. The plants which are most injured by changa are cane, tobacco, and rice. Other crops are somewhat damaged, such as tomato, eggplant, cabbage, etc. The insect was not considered a serious pest until after 1876. It is less injurious in the mountain districts where the soil is clayey than in the sandy loams of the valleys. The greatest injuries are done from October to December.

A large number of remedies have been tried against this insect, with various results. Tobacco plants may be protected by a wrapping of leaves of *Mammea americana*, or wire gauze. Cheese cloth, mulches of tobacco stems beneath the surface, pomace from castor-oil presses, and coal-tar barriers have been tried, without much success. Clean cultivation is effective if persisted in for some time. Lantern traps which emit an intense light have been found quite useful in attracting the insects. Naphthalin is found to be one of the best repellant remedies. Carbon bisulphid was effective, but rather too expensive. Creosote and creolin exhibit little or no repellent action. Kerosene appeared to be effective, but injured the plants to some extent. The best artificial remedy was found to be a poison bait prepared by sprinkling chopped grass with arsenic or Paris green and placing this material upon or just beneath the surface of the soil.

The most important natural enemy of the changa is the native species of blackbird. Other species of birds have been observed feeding upon the changa.

Army worms on millet, G. D'UTRA (*Bol. Agr. São Paulo, 3. ser., 1902, No. 3, pp. 158–162*).—Notes on the habits and life history of *Leucania unipuncta* and on means of combating this insect in millet fields.

Methods of controlling the boll weevil, W. D. HUNTER (*U. S. Dept. Agr., Farmers' Bul. 163, pp. 16, figs. 2*).—The Division of Entomology has a contract whereby certain planters agree to manage the cotton crop in certain locations under the directions of the Division. About 350 acres were managed in that way during 1902. The cotton-boll weevil, while confined to Texas, occupies about 28 per cent. of the cotton acreage of the United States. It has been shown, however, that cotton can be grown profitably in spite of the attacks of this insect. The author believes that the weevil will ultimately be distributed all over the cotton belt, since there are no influences which can check its distribution. The author mentions a number of methods which are ineffective in combating the weevil. These include various nostrums, machines, and the use of cotton-seed meal. It was found that the various varieties of Egyptian cotton are more susceptible to damage by the weevil than are the ordinary varieties of American upland cotton. The remedies which are recommended for controlling the weevil include early planting, thorough cultivation of the fields, destruction of all cotton stalks in the fall not later than the first week in October, planting the rows far apart, and thinning out the plants in the rows.

Potato insecticides and fungicides in 1902, C. D. WOODS (*Maine Sta. Bul. 87, pp. 197–209*).—A number of insecticides were used in combating the potato beetle, among which mention may be made of Paris green, arsenate of lead, Black Death, Quick Death, English Bug Compound, Kno-bug, and Hammond's Slug Shot. A test of the value of Kno-bug as a fungicide was made by the station with the result that the yield was found to be much less on plats treated with this substance than on others treated with Bordeaux mixture. The disease which affected the potatoes in this experiment was rot. An analysis of Kno-bug showed it to contain only about 2½ per cent of Paris green, while 88 per cent was ordinary land plaster.

An experiment was instituted for the purpose of testing the relative value of Paris green, Bug Death, and arsenate of lead in combating potato bugs. The amounts of Bug Death used were those recommended by the manufacturers. The field was sprayed 5 times. The results of these experiments are presented in detail. It was found that at no time was there any noticeable difference in the color, size, or vigor of the vines treated with the different substances. Paris green kept the vines rather freer from potato bugs than did Bug Death or arsenate of lead. In an experiment conducted by E. A. Rogers potatoes treated with Bug Death were found to yield more heavily than those sprayed with Paris green or other insecticides. These results, however, were not confirmed by the station work.

Insects injurious to Cucurbitaceous plants, H. A. SURFACE (*Pennsylvania Dept. Agr. Bul. 96, pp. 30, pls. 24*).—The insects which most commonly attack cultivated cucurbits are discussed in systematic order and notes are given on the best remedies for combating the different species. The insects to which most attention is given are onion thrips, squash bug, melon louse, cucumber louse, pickle moth, melon worm, squash borer, *Epilachna borealis*, cucumber beetles, flea-beetles, and undetermined fly larvae. Occasional injury is noticed from Limax, centipedes, and earth worms.

The remedies discussed by the author include net covering, paper tent for fumigating with bisulphid of carbon, tarred board, board traps, various cultural remedies, such as clearing up rubbish, killing weeds, rotation of crops, use of trap crops, hand picking, fertilizers, late fall plowing, early planting, excessive seeding, and the use of insecticides, such as Paris green, London purple, arsenite of lime, kerosene in emulsion and in mechanical mixture with water, whale-oil soap, carbon bisulphid, gasolene, calcium carbid, tobacco, sulphur, and lime.

Some garden pests, W. W. FROGGATT (*Agr. Gaz. New South Wales, 13 (1902), No. 12, pp. 1167–1173, pls. 2*).—Brief notes are given on the habits, life history, and means of combating *Helix aspersa, Siphonophora rosæ*, fluted scale, red orange scale, and various species of butterflies which are more or less injurious to garden crops.

Combating the enemies of asparagus, K. SAJO (*Prometheus, 13 (1902), Nos. 656, pp. 497, 498; 657, pp. 521–524*).—Notes are given on the habits and life history of *Platyparea pœciloptera*, the 12-spotted and 14-spotted asparagus beetles, asparagus rust, and *Agromyza maura.*

Codling moth, R. A. COOLEY (*Montana Sta. Bul. 42, pp. 18*).—The codling moth has not yet become established in commercial orchards in Montana. The insect has been found in Missoula, Thompson Falls, Helena, and Kalispell. According to the author's observations larvæ of the first brood were found in 50 out of 323 apples, and when the second brood appeared 115 out of 144 apples were infested, while the amount of destruction was placed at about 51 per cent. It is believed that birds assist considerably in destroying these insects. In the Bitter Root region an insect, which was apparently not codling moth, was found infesting the apple. Notes are given on the habits and life history of codling moth. In Montana it is believed that there are 2 broods per year. Paris green is recommended as an insecticide, together with the use of bands.

Codling moth, K. SAJO (*Prometheus, 13 (1902), Nos. 661, pp. 577–580, fig. 1; 662, pp. 593–596*).—A popular account is given of the habits, life history, and means of combating the codling moth as shown by the experimental work of investigators in various countries.

Biological investigations of the nun (Lymantria monacha), its parasites and diseases, S. BENGTSSON (*Ent. Tidskr., 23 (1902), No. 2–3, pp. 125–194, pls. 2*).—On account of the unusual destruction caused by the nun in various parts of Sweden an investigation of the habits of this insect with special reference to successful means of combating it was instituted by the Swedish government. The present report contains an extensive account of the life history and habits of this insect, the bacterial and fungus diseases which have been found attacking it, and notes on the various insects which live upon it as parasites. As a result of these investigations it is concluded that the only successful way of fighting the nun on a large scale consists in banding the trees with some sticky preparation and utilizing badly infested trees for fuel and manufacturing purposes.

The brown-tail moth in Massachusetts, A. H. KIRKLAND (*Trans. Massachusetts Hort. Soc. 1902, I, pp. 12–21*).—The author discusses the early European history of this insect and an account is given of its introduction and spread in America. The best results in controlling the insect have been obtained from the use of arsenate of lead and kerosene emulsion.

The woolly aphis on the roots of apple trees, C. RITTER (*Ztschr. Pflanzenkrank., 12 (1902), No. 1–2, pp. 7–10, pl. 1*).—Brief notes are given on the appearance of galls caused by woolly aphis on the roots of apple trees. The insects were observed also on the roots of young pear trees. The author knows of no effective means for preventing the ravages of this insect provided it should attack young trees. The use of lime is recommended, together with the destruction of badly infested trees.

The mango shield scale (*Agr. News [Barbados], 2 (1903), No. 21, p. 40*).—Notes are given on *Lecanium mangiferæ*, which is becoming rather injurious in the West Indies. The chief natural enemy of the insect is a fungus disease which manifests itself as a white mold upon the dead scales.

Distinctive characteristics of the species of the genus Lecanium, W. C. THRO (*New York Cornell Sta. Bul. 209, pp. 201–221, pls. 5*).—Detailed notes are given on the external anatomical characters of the genus Lecanium with special reference to features which may be used in distinguishing the species. A number of species of this genus are described by way of illustration of the use of these anatomical features, and an analytical key is presented for the identification of the species described.

The development of the cherry fly, K. Sajo (*Prometheus, 14* (*1902*), *No. 679, pp. 33, 34*).—Notes are given on the life history and habits of *Spilographa cerasi.* In the opinion of the author it is still doubtful whether there are two different races of this species, of which one completes its life cycle in 1 year while the other requires 2 years for full development.

The frit fly (Oscinis frit) (*Landtmannen, 14* (*1903*), *No. 4, pp. 57–60*).

The grape-root worm—further experiments and cultural suggestions, M. V. Slingerland and J. Craig (*New York Cornell Sta. Bul. 208, pp. 173–200, pls. 8*).—The present distribution of this species is from the Middle States to Dakota and south to Florida and Texas. In New York it has proved injurious only in Chautauqua County, where it appears to attack chiefly vineyards which have been neglected from a cultural standpoint. Many vines are killed outright and most of them are weakened so that they are practically ruined. Notes are given on the life history and habits of the beetle. The natural enemies of this insect in New York so far as observed are chickens, ants, and a few species of birds.

The remedial measures undertaken by the authors included fertilizer experiments and attempts to use native grape roots resistant to the attacks of the grubs. The roots of a number of native types of American grapes have been used and subsequently grafted with the standard varieties grown in Chautauqua County, but 2 or 3 years will be required before definite results are known. Experiments with fertilizers indicate that many injured vineyards can be invigorated by proper application of these substances. The best results were obtained from thorough cultivation of the soil. It is believed that if the soil is cultivated thoroughly in June and July the grape-root worm will be prevented from becoming a serious pest. The cases in which the pupæ lie are thus broken up and the insects fail to reach the adult stage. Experiments with insecticides were not so favorable, and the authors believe that more can be done by cultivation than by the use of poisoned sprays. Jarring the beetles was found to be a laborious method, and while more or less effective is not considered very practicable for ordinary use. Brief notes are given on the fertilizers best adapted for use in vineyards and on the proper cultural methods.

Tortrix pilleriana, J. Dufour (*Chron. Agr. Canton Vaud, 15* (*1902*), *No. 24, pp. 682–688, figs. 7; 16* (*1903*), *No. 2, pp. 31–34*).—A method much used in certain parts of France for controlling this insect consists in the application of hot water to the pruned grapevines. In recent years a number of experiments have been made with solutions of acids, during which sulphuric, nitric, and hydrochloric acids were used. The best results were obtained by spraying the grape stock with a 10 per cent solution of sulphuric acid in water.

Insects affecting forest trees, H. Osborn (*Jour. Columbus Hort. Soc., 17* (*1902*), *No. 3, pp. 79–92*).—Notes on the habits and life history of bark beetles, banded hickory borer, white ants, San José scale, periodical cicada, dog-day cicada, willow sawfly, walnut caterpillar, fall webworm, white-marked tussock moth, Cecropia moth, American silkworm, bagworm, *Notodonta concinna,* and *N. unicornis.*

On the ravages of the spruce spinner (Bombyx pini), W. M. Schöyen (*Norsk Landmandsblad, 21* (*1902*), *No. 48, pp. 577–582*).

The biology of red spiders, R. von Hanstein (*Ztschr. Pflanzenkrank., 12* (*1902*), *No. 1–2, pp. 1–7*).—Notes are given on the habits and life history of *Tetranychus telarius* and *T. althææ.* These species are said to cause considerable injury to shade trees in Berlin and other cities where the author made investigation. The dry weather was favorable to the development and multiplication of both species. In combating these mites the author recommends the use of those remedies which are applicable in the destruction of woolly aphis. On young trees or in situations where the application is practicable, tobacco dust and lime may be used with good effect. A number of natural enemies prey upon these species, especially the larvæ of Chrysopa and Hemerobius.

Notes on a Phytoptus, A. KEMPEL (*Bol. Agr. São Paulo, 3. ser., 1902, No. 2, pp. 87–90, figs. 2*).—The *Phytoptus fuchsiæ* is said to be injurious to fuchsias and is described as a new species. It is said to be closely related to *P. oleivorus.* Considerable difficulty will usually be experienced in combating this insect, on account of the tender nature of the affected plants.

Combating injurious insects by means of their natural enemies, K. SAJO (*Prometheus, 13 (1902), Nos. 667, pp. 673–676, fig. 1; 668, pp. 689–692, figs. 2*).—The author presents a summary account of the results which have thus far been obtained in combating noxious insects by means of parasitic fungi and parasitic and predaceous insects.

Spray calendar, W. E. BRITTON and G. P. CLINTON (*Connecticut State Sta. Bul. 142, pp. 19, figs. 4*).—This bulletin is arranged in the form of an ordinary calendar and contains formulæ for preparing common insecticides and fungicides. The more important economic plants are arranged in alphabetical order, with brief notes on their insect and fungus diseases.

Spray calendar, N. O. BOOTH (*Missouri Sta. Circ. of Information 10, pp. 13*).—Brief notes are given on the efficacy of spraying and on methods of preparing fungicides and insecticides. A brief spraying calendar is given indicating the time of year and nature of the applications required for controlling the insect and fungus diseases of common economic plants.

Spray calendar, W. LOCHHEAD (*Ontario Agr. Col. and Expt. Farm Bul. 122, pp. 12, fig. 1*).—Formulæ are given for the preparation of Bordeaux mixture, copper sulphate, ammoniacal copper carbonate solution, potassium sulphid, Paris green, poison bait, hellebore, pyrethrum, kerosene emulsion, tobacco decoction, whale-oil soap, crude petroleum, lime wash, formalin, and carbon bisulphid. The chief enemies of a number of the more common economic plants are mentioned, together with remedies for combating these pests.

On the choice of a soft soap for hop spraying, C. DUNCAN (*Agr. Student's Gaz., n. ser., 11 (1902), No. 1, pp. 16–18*).—The author presents notes on the means of detecting and estimating resin in soft soap, and also on methods for determining other constituents in these soaps with reference to their use and effectiveness in destroying hop insects.

Report of analyses of Paris green and other insecticides in 1902, L. L. VAN SLYKE and W. H. ANDREWS (*New York State Sta. Bul. 222, pp. 263–268*).—Analyses were made of 44 samples of Paris green, in which the amount of arsenious oxid varied from 55.39 to 61.4 per cent, averaging 57.1; the amount of arsenic soluble in water averaging 1.01 per cent. The quantity of copper oxid varied from 27.03 to 30.79 per cent, averaging 29.41. The average amount of arsenious oxid in combination with copper was 55.1. The results obtained during these analyses indicate that the Paris green found on the market during 1902 was of a satisfactory quality.

Hypoderma bovis, F. ETCHEGOYHEN (*Bol. Sec. Fomento [Mexico], 1 (1902), No. 11, I, pp. 481–487*).—Notes on the appearance, habits, life history, and means of combating this insect.

Sheep gadfly (*Jour. Bd. Agr. [London], 9 (1902), No. 2, pp. 217, 218*).—Notes are given on the appearance and habits of *Œstrus ovis.* In preventing the attacks of this fly it is recommended that a mixture of tar and fish oil in equal parts be smeared on the nose of the sheep.

Injurious household insects, S. LAMPA (*Ent. Tidskr., 23 (1902), No. 2–3, pp.*

122-124).—Biological and economic notes are given on *Tinea pellionella*, *T. granella*, *T. tapetzella*, and *Tineola bisselliella*.

Remedies for fleas, A. F. Conradi (*New Hampshire Sta. Bul. 94, pp. 89-92*).—A study was made of various remedies which may be applied in destroying the dog flea. Persian insect powder and hand picking were found to be too laborious methods or ineffective. The best results were obtained from the use of creolin washes. The animal may be thoroughly washed with the hands or a brush, or may be submerged for a period of 5 minutes in a solution of creolin. For dogs a 3 per cent solution is recommended, and for cats a 2 per cent solution. In addition to this treatment it is recommended that rugs be substituted for carpets, and that floors and resting places for dogs and cats be treated with a 5 per cent solution of creolin. Hydrocyanic-acid gas is recommended only as a last resort.

Mosquitoes in Algiers, Edmond and Étienne Sergent (*Ann. Inst. Pasteur, 17 (1903), No. 1, pp. 60-67, figs. 14*).—Brief notes on a number of species of mosquitoes collected within a radius of 15 km. of Algiers. In this region 9 species were observed, 3 of which are described as new. The new species are *Anopheles algeriensis*, *Culex sergentii*, and *C. mariæ*.

Forest mosquitoes and forest malaria, A. Lutz (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 4, Orig., pp. 282-292, figs. 7*).—The author discusses the occurrence and frequency of different species of mosquitoes in the forested districts. A number of plants have been found which furnish receptacles at the bases of the leaves or in specially modified portions of the leaves in which sufficient water may be contained to serve as breeding places for mosquito larvæ.

Description of a new Anopheles, C. S. Ludlow (*Jour. Amer. Med. Assoc., 39 (1902), No. 8, pp. 426, 427*).—In the Philippine Islands a number of species of mosquitoes have been found, including *Stegomyia fasciata*, *Culex fatigans*, *Panoplites africanus*, and *Anopheles philippinensis*, the last species being described as new.

Combating Anopheles, D. Rivas (*Centbl. Bakt. u. Par., 1. Abt., 33 (1902), No. 3, Orig., pp. 235-238*).—Glass vessels were filled nearly full of water and a film of kerosene was gradually spread over the surface. The eggs of Anopheles were then placed upon the surface, and after 2 or 3 days it was found that a number had sunk to the bottom. Some of the larvæ, however, developed, but for the most part rather weakly. In other vessels which were covered with a film of machine oil the larvæ appeared to develop as vigorously as in pure water. The author therefore made use of kerosene exclusively in destroying the eggs, larvæ, and pupæ of mosquitoes in pools and bodies of stagnant water.

Report of the Agricultural and Mechanical College apiary, F. W. Mally and W. Newell (*Austin, Tex.: Von Boeckmann, Schutze & Co., 1902, pp. 53, pl. 1, figs. 29*).—An appropriation was made by the State of Texas for the purpose of establishing an experimental apiary under the direction of the State entomologist. Notes are given on the establishment of this apiary and on certain experiments which were conducted during the first year. It is proposed to study different races of bees and to determine as nearly as possible the comparative length of life of bees of different races. Special attention is given to a study of various drought-resistant bee plants. A large number were found to be partial or total failures. These include a number of native species of leguminous plants, as well as various clovers, English rape, soy bean, velvet bean, etc. Japanese buckwheat gave the best results, while fairly good results were obtained from black mustard, mignonette, and borage. It is stated that in Uvalde County colonies of bees in average seasons yield from 100 to 200 lbs. of honey. A practical manual of bee keeping was compiled and presented as the second part of the report. This contains a discussion of the various matters relating to the care and management of bees.

Annual report of the Royal Sericultural Station at Padua (*Ann. R. Staz. Bacol. Padova, 30 (1901), pp. 121, pl. 1, figs. 3*).—A brief summary of the work of the station is given by the director, E. Verson. The report also contains a number of articles dealing with various phases of sericulture, and the following brief notes are made upon these articles:

The fluids which cause the loosening of the skin in the molting process of insects, E. Verson (pp. 17-32).—Notes are given on the specialized cells which produce this fluid in insects. The author's observations and studies were confined largely to the silkworm, and his results are compared with those obtained by W. L. Tower in a study of the potato beetle.

Impermeability of the cell of the silkworm egg to alcohol, E. Quajat (pp. 33-36).—An investigation of this subject showed that the immersion of eggs of various races of silkworms for periods varying from 5 to 50 minutes in alcohol did not cause any injury to the eggs, since the shell did not appear to be penetrated by the alcohol.

The effects of prolonged hibernation on the silkworm eggs of various races, E. Quajat (pp. 40–49).—A summary account is presented of experiments along this line conducted during the years 1899–1901. It was found that the Chinese race of silkworms was most susceptible to the injurious effects of prolonged low temperature, while the yellow Asiatic race appears to be much less affected by this agency.

Influence of external conditions upon the physical properties of cocoons, E. Verson (pp. 50–54; 73–80).—The author's experiments were made on 2 races, the Sciaohing and Sierra Morena. The experiments were confined to a test of the effect of methods of feeding and different feeding stuffs upon the color, elasticity, and tenacity of silk.

The number of silkworm moths which can be fertilized by a single male, E. Quajat (pp. 55–72).—A considerable variation was observed in different races, the number of females fertilized by a single male varying from 3 to 15.

Brief notes are also given on spermatogenesis of insects as related to the silkworm, and on the influence of dry and moist air during the spinning and maturation period of the pupae. An elaborate bibliography of publications relating to sericulture which appeared during the years 1901 and 1902 is also given (pp. 97–120).

Experiments at the Sericultural Station of Murcia for 1902, E. Lopez (*Cartilla para la crianza y ahogado del gusano de la seda. Levante, 1902, pp. 6*).—Brief notes on the incubation of silkworm eggs and on the relative numbers which proved to be fertile or infertile.

Rearing and killing silkworms, E. Lopez (*Levante: Min. Agr. Ind. and Com., 1902, pp. 23*).—Brief notes on the cultivation of mulberries and on the various processes concerned in rearing and killing silkworms.

The silkworm in Spain, A. E. Carleton (*U. S. Consular Rpts., 71 (1903), No. 270, pp. 418, 419*).—In 1901 the silkworm crop of Spain is said to have been considerably below that of 1900. The French species of silkworm continues to be cultivated more than other varieties.

Silkworms in Italy, W. Jarvis (*U. S. Consular Rpts., 71 (1903), No. 270, pp. 419, 420*).—The breeds of silkworms cultivated in Italy are stated as being the pure yellow, the white indigenous, and the Japanese cross. The only silkworms bred in Italy are those which feed on the mulberry leaf. Brief notes are given on the planting and care of mulberry trees and on the rearing and value of silkworms in Italy.

FOODS—NUTRITION.

Food adulteration, F. W. Traphagen (*Montana Sta. Bul. 38, pp. 24*).—The examination of a large number of foods and condiments showed that food adulteration was common in Montana. In connection with this work proximate analyses were made of samples of crackers, biscuits, cereal breakfast foods, baking powders, flours, and vinegars.

The detection of a small amount of salicylic acid in a sample of jam, which there was reason to believe contained no added preservative, led the author to study the natural occurrence of salicylic acid in fruits. Its presence was demonstrated in strawberries, red and black raspberries, blackberries, currants, plums, black cherries, apricots, peaches, Concord grapes, crab apples, standard apples, quinces and oranges, and also in tomatoes, cauliflower, and string beans. In a few instances quantitative determinations of salicylic acid were made showing the following amounts in milligrams of acid per kilogram of fruit: Currants 0.57, cherries 0.46, plums 0.28, crab apples 0.24, grapes 0.32. These values are not regarded as absolute, since check analyses made with known amounts of salicylic acid showed that not nearly all the acid was extracted by the method followed. The author states that he distilled the fruit with phosphoric acid, extracted the distillate with ether, took up the resulting material with a small amount of water and applied the ferric chlorid test after the ether had evaporated.

Occurrence of salicylic acid in fruits, F. W. TRAPHAGEN and E. BURKE (*Jour. Amer. Chem. Soc., 25 (1903), No. 3, pp. 242-244*).—Noted above from another source (see above).

Food adulteration, E. F. LADD (*North Dakota Sta. Bul. 53, pp. 115-151*).—With the view of detecting added coloring matters, preservatives, and adulterants, analyses were made in accordance with the State pure-food law of a number of samples of jams, jellies, and similar products, catsups, canned soups, canned vegetables, pork and beans, extracts, candies, cream of tartar, and spices. Analyses are also reported of a number of samples of cereal breakfast foods, pancake flours, plasmon and plasmon biscuit, nutrium, and milk flour. It is the author's opinion, based on the results of his investigations, that the law to prevent food adulteration is not being complied with by the producers whose goods are sold in the State, and that some active measures are necessary.

Cereal breakfast foods. A. McGILL (*Lab. Inland Rev. Dept. Ottawa, Canada, 1902, Bul. 84, pp. 31, pl. 1*).—Analytical methods are discussed and detailed analyses reported of a number of samples of malt breakfast foods, oatmeal and other breakfast foods, pea meal, and corn meal. Special interest attaches to the determination of starch in the malted products, as it is claimed by the manufacturers that in such goods insoluble starch has been largely converted into soluble bodies. The author states that oatmeal gave but 3.85 per cent of material soluble in cold water, while several of the specially prepared foods gave 20 per cent or more. Many of the cereal foods had been cooked more or less during the process of manufacture. According to the author "the chief object sought in boiling porridge is to render the starch soluble; and where conditions make it difficult or impossible to properly cook one's porridge, there is doubtless an advantage in using a material that has already undergone some change in this regard. Whether or not the high prices at which these foods are sold are sufficiently warranted by the saving of fuel and time, under ordinary conditions of domestic life, is a question to be solved by each housekeeper for himself.

"There is, however, another point of view from which these foods may be regarded, viz, their content in proteid matter. In this respect pea meal excels them all. There is, however, good reason to believe that the proteids of the pea and bean, and of leguminosæ in general, are less easily digested by man than are the proteids of the cereal grains proper. Among these oatmeal takes first rank, but several of the prepared foods stand very well in this regard. If we take into account the mineral matter (ash) which is no less necessary to complete nutrition, we find marked differences among these foods. If one were to live entirely or principally upon these foods, it would be very necessary to take account of this. Finally, on account of its very high energy factor, we may lay stress upon the content of fat; and here also oatmeal stands in the first place."

Estimating the value of wheat and wheat flour by means of baking experiments, K. KOMERS and E. VON HAUNALTER (*Ztschr. Landw. Versuchsw. Oesterr.,* *5 (1902), No. 11, pp. 1225–1265, fig. 1).*—The authors discuss critically the usual methods of testing the baking quality of flour and believe that this may be satisfactorily learned by the aid of laboratory baking experiments. The importance of working with dough of uniform consistency and using zymin as a ferment is insisted upon. According to the authors, the volume of the sample of baked bread may be best determined by coating the bread with paraffin and noting the amount of water displaced in a piknometer of suitable form (which is described), corrections of course being introduced for the amount of paraffin adhering to the bread.

Examination of artificially colored barley grits, E. Kramer (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 4, pp. 588, 589).*—Analytical data are reported and discussed.

Desiccated meat, F. B. Guthrie (*Agr. Gaz. New South Wales, 13 (1902), No. 12, pp. 1248, 1249).*—Methods of drying meat so that it can be reduced to a powder, which may be stored without deterioration, were studied, as well as the digestibility of such products. The most satisfactory results were obtained when meat, ground in an ordinary sausage cutter, was spread on a fairly open sieve in a drying oven. This permitted the melted fat to run away and, it is said, greatly expedited drying.

"The oven was left open so as to allow free access of air, and after 4 hours drying, at a temperature of 65 C. to 70° C. (and which never rose above 70° C.) the product was sufficiently dry to be readily reduced to a fairly fine powder in an ordinary mill. The product obtained at this temperature is a light-colored, slightly reddish powder containing 11 to 12 per cent water, of an agreeable odor and exceedingly palatable, especially if a little salt is added. It keeps perfectly in stoppered vessels. A sample prepared in a very similar way in June, and placed in an ordinary corked flask, is still perfectly sweet 4 months later, though the cork has been frequently removed during that time. If packed in air-tight tins, or in tins from which all air has been excluded, there is every reason to suppose that the powder will keep for an indefinite period. The time taken in drying could no doubt be considerably shortened if a fairly rapid current of dry air were passed through the drying chamber during the process. This was not found practicable with the appliances available, as it was impossible to prevent the accumulation of moisture on the walls and ceiling of the oven."

As shown by artifical digestion experiments 96 per cent of the dry matter of the desiccated beef was digestible as compared with 96.6 per cent from fresh raw beef.

Examination of meat juice, R. Vogel (*München. Med. Wchnschr., 1902, No. 17, p. 6; abs. in Ztschr. Fleisch. u. Milchhyg., 12 (1902), No. 11, p. 352).*—According to the experiments reported, juice can not be extracted normally, even under high pressure, from freshly slaughtered, i. e., living muscular tissue. When muscle cells die their proteid contents begin to liquefy, the amount of liquefaction being proportional to the temperature. Meat juice is regarded as a product of post-mortem proteolysis, that is, as due to a form of autolysis of the muscles and not to decomposition or to the formation of acid. It is considered as a part of an extended cleavage of the protein molecule. Unorganized ferments are regarded as the cause of this muscle autolysis, although they were not identified. The characteristics of the fresh meat juice are discussed and its food value is pointed out, attention being directed especially to the fact that it is useful when less than ordinary work should be required of the digestive organs and a liquid diet is indicated.

Identification of horse flesh by means of a specific serum, G. Gröning (*Ztschr. Fleisch. u. Milchhyg., 13 (1902), No. 1, pp. 1–4).*—According to the author the subcutaneous injection of the juice of horse meat produces a serum in the blood of rabbits which serves for the identification of horse meat when it has not been cooked or heated. When even a trace of solution containing horse flesh is added to the clear yellow serum a cloudiness is observed and later a precipitate. Precautions necessary in the use of the serum are noted.

On certain exotic Graminæ used as food, BALLAND (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 23, pp. 1079, 1080*).—Analyses are reported of the seeds of *Elusine stricta*, *Paspalum frumentaceum*, *P. langiflorum*, and *P. scrobiculatum;* hulled *paspalum*, called "fonio;" *Penicellaria spicata* (*Penicetum spicatum*), *Holeus sorghum* (*Sorghum vulgare*), and "Tef," or *Poa abyssinica*.

Lime juice and catsup, A. MCGILL (*Lab. Inland Rev. Dept. Ottawa, Canada, 1902, Bul. 83, pp. 19*).—Twenty-six samples of catsup and 27 samples of lime juice were examined. A considerable amount of data is summarized regarding the physiological effects of coloring matters and preservatives, and facts regarding the occurrence of both in catsup and of the latter in lime juice are reported.

Unfermented grape juice, T. MACFARLANE (*Lab. Inland Rev. Dept. Ottawa, Canada, 1902, Bul. 82, pp. 5*).—Analyses are reported of 18 samples examined especially for the detection of alcohol and added preservatives.

The composition of fresh and canned pineapples, L. S. MUNSON and L. M. Tolman (*Jour. Amer. Chem. Soc., 25 (1903), No. 3, pp. 272–280*).—Previously noted (E. S. R., 14, p. 522).

The chemical composition of food preservatives, J. B. WEEMS and I. J. MEAD (*Iowa Sta. Bul. 67, pp. 259–265*).—An examination was made of a number of different brands of Preservaline, recommended by the manufacturers for preserving different kinds of food, which led to the following deductions:

"The various brands of preservatives are composed of common substances such as boric acid and borax, salt, formaldehyde, etc., which can be prepared at a cost less than that charged for these substances under some other name. The claims made by those selling mixtures for preserving food under meaningless terms are of no value and are misleading. With proper care and by hygienic conditions connected with the production of dairy and food products, preservatives are unnecessary.

"The use of food preservatives are prohibited by many States, and the use of such substances under some other name does not excuse the person using them."

Preservatives and coloring matters in food, C. E. CASSAL (*British Food Jour., 4 (1902), Nos. 40, pp. 76–78; 41, pp. 99, 100; 42, pp. 124, 125; 43, pp. 146–148*).—The characteristics, effects, and legal aspects of the use of different preservatives and coloring matters are discussed, work done by the author being cited.

Chemical studies of paprika, W. SZIGETI (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 10, pp. 1208–1222*).—Physical and chemical studies of paprika oil were undertaken with the special object of furnishing means for the detection of adulterating powdered paprika with oil.

Concerning organic compounds of sulphurous acid in foods, W. KERP (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 2, pp. 66–68*).—A preliminary note on experiments, showing, it is claimed, that when fruits are bleached with sulphur fumes some sulphurous acid is retained in chemical combination.

Investigations on the nutrition of man in the United States, P. O. SMOLENSKI (*Hyg. Rundschau, 12 (1902), Nos. 18, pp. 905–932; 19, pp. 973–1006; 22, pp. 1133–1157*).—In this article, a translation of one previously published by the author in Russian (E. S. R., 14, p. 69), the nutrition investigations which have been carried on under the auspices of the U. S. Department of Agriculture are described in detail.

The dietary of families of Danish laborers, M. RUBIN (*Consommation de familles d'ouvriers Danois. Rome: J. Bertero & Co., 1902, pp. 84*).—This paper, which is an extract from *Bulletin de l'Institut international de statistique* (vol. 13, No. 3), gives statistics of the sums annually expended by the families of Danish laborers for different articles of diet, as well as of other family expenses, the data being discussed with special reference to the family dietary.

Filipino ration, emergency ration, etc., J. F. WESTON (*Com. Gen. Subsist. U. S. Army, Rpt. 1902, pp. 26, 27*).—The kinds and amounts of different foods making up the ration of enlisted men of the Philippine Scouts, when on garrison or field service, are noted and other topics connected with the army ration are treated of. It is stated that the emergency ration, discussed at length in a previous publication,[a] has been quite generally used in the Philippines, "though it has not proved wholly a success, but experiments are still in progress, and it is expected that in due time a ration of this character will be evolved which will prove satisfactory in every respect."

What one eats in the Philippines, A. W. GREELEY (*Ladies' Home Jour., 20 (1903), No. 4, p. 10*).—The author briefly discusses the fruits, vegetables, meats, and fish used in different localities in the Philippines, methods of preparation, diet of natives and foreigners, and related topics.

Alcohol and muscular energy, L. SCHNYDER (*Arch. Physiol. [Pflüger], 99 (1903), No. 9–10, pp. 451–484, figs. 7*).—In the experiments reported muscular work was performed with a Dubois ergograph, which is a modification of the apparatus devised by Mosso. The following conclusions were reached: Small doses of alcohol have a favorable effect upon muscular action when taken fasting and when the bodily strength is, to some extent, reduced as a result of individual condition. The favorable effect is less than that of a food of like energy value. At the same time the alcohol hinders the action of the nervous system, the amount being proportional to the physiological condition of the subject. When sufficient energy is provided by the food, alcohol has no value, but on the other hand its effect on the nervous system is more pronounced and results in a diminution of muscular power.

A physiological study of nucleic acid, L. B. MENDEL, F. B. UNDERHILL, and B. WHITE (*Amer. Jour. Physiol., 8 (1903), No. 5, pp. 377–403, dgm. 1*).—In this article, which has to do with the chemistry, physiological action, and fat in the body of nucleic acid, the authors review at length the previous investigations on the subject, and report experiments with lower animals and with man, the work being summarized as follows:

"The more important observations recorded in this paper indicate that the vegetable nucleic acid obtained from the wheat embryo resembles, in its physiological effects, the guanylic acid of the pancreas. Introduced in sufficient doses into the circulation, it may produce a fall in arterial pressure; a change in the coagulability of the blood; an increase in the flow of lymph and a change in its composition; and perhaps, also, a degree of immunity toward subsequent injections.

"The ingestion of nucleic acid is followed in man by an increased output of uric acid, and in the dog by the excretion of allantoïn. These products correspond in either case to only a portion of the purin radicals introduced. In animals, allantoïn excretion was also observed after the introduction of vegetable nucleic acids into the body per rectum, intravenously, intraperitoneally, and subcutaneously. Some features of intermediary purin-metabolism are discussed."

Notes on the "protagon" of the brain, W. W. LESEM and W. J. GIES (*Amer. Jour. Physiol., 8 (1902), No. 3, pp. 183–196*).—Chemical studies, including elementary analyses, led the authors to the conclusion that "the protagon of the brain is a mixture of substances, not a chemical individual, [and that] the mixture called protagon does not contain the bulk of the phosphorized organic substance of the brain."

Camp fires in the wilderness, E. W. BURT (*Boston: National Sportsman Press, 1902, pp. 164, pls. 23*).—In addition to other matters pertaining to camps and camping, the author discusses food and its preparation in camp, giving a number of recipes and an estimate of the kinds and amounts of food sufficient for 3 men on a 2 weeks' camping trip.

How I live without cooking, W. T. LARNED (*Ladies' Home Jour., 20 (1903), No. 3, p. 18*).—The author states that for some 2 years he has lived almost exclusively on a diet of raw cereals, fruits, nuts, vegetables and milk, butter and eggs, with the addition of some raw meat during a part of the time, the average cost of the diet being about 30 cents per day.

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[a] Com. Gen. Subsist. U. S. Army Rpt., 1901, pp. 54–98.

Yeast and its household use, F. C. Harrison (*Ontario Agr. Col. and Expt. Farm Bul. 118, pp. 16, figs. 6*).—As a result of experiments made to determine the rapidity of fermentation of yeast procured from a number of sources, it was found that "there were three which gave a much more rapid fermentation than any of the others, and which were considered to be equal. One of these was from a distillery, one from a compressed yeast (sold for bread making and ordinarily produced at a distillery), and the third from a home-grown yeast which had been started with a compressed distillery yeast. The beer yeasts in several instances gave better results than yeasts sold specially for bread making. Some of the latter gave very poor results indeed, showing that sufficient care had not been taken when starting the growth of the yeast at the factory to obtain one which was well adapted to bread making. The experiments show the superiority of distillery yeasts over brewery yeasts for the fermentation of flour. They seem to act upon the starch of the flour more energetically than do the beer yeasts. In experiments made on mixtures of flour and water in fermentation tubes, the distillery yeasts always produced considerably more gas than did the other kinds; they also produced the gas more quickly."

The general subjects of yeasts and their uses are discussed and suggestions are given for the household preparation of yeast. The comparative merits of different sorts of bread are also spoken of briefly.

ANIMAL PRODUCTION.

The principles of animal nutrition, H. P. Armsby (*New York: John Wiley & Sons, 1903, pp. VIII+614*).—This volume, which in substance represents the author's lectures before the Graduate Summer School of Agriculture at the Ohio State University in 1902, summarizes in systematic form the valuable information which has accumulated regarding the principles of animal nutrition, especially from the standpoint of energy relations and their bearing upon the nutrition of farm animals. The main divisions of the volume deal with the income and expenditure of matter and of energy. Under the former subject the author discusses food, metabolism, methods of investigation, fasting metabolism, the relations of metabolism to food supply, and the influence of muscular exertion upon metabolism. In the section devoted to energy the subjects are force and energy, methods of investigation, the conservation of energy in the animal body, food as a source of energy—metabolizable energy, internal work, net available energy—maintenance, and the utilization of energy. In every case the author has discussed in detail the results of experiments published by numerous writers and summarized them with especial reference to their bearing upon the metabolism of matter and energy.

The most satisfactory terminology for use in discussions concerning the income and outgo of energy is a matter on which opinions differ, and Professor Armsby has proposed the term "metabolizable energy" for that fraction of the energy of the food which can enter into the metabolism of energy in the body. "Metabolizable energy, then," he states, "may be briefly defined as potential energy of food minus potential energy of excreta, including under excreta, of course, all the wastes of the body, visible and invisible. The method is analogous to that of the determination of digestibility. In both cases it is a calculation by difference, and the result shows simply the maximum amount of matter or of energy put at the disposal of the organism without affording any clue to the use made of it by the latter—that is, to its availability in the more restricted sense."

The appendix includes tables showing the metabolizable energy of coarse fodders and other feeds, and the energy expended by a horse in locomotion and drawing a load under different conditions. A detailed index adds to the value of the volume, which summarizes in a form very useful for advanced students the experiments and conclusions of the leading modern investigators, and the theories and the deductions which may be drawn from the large amount of valuable experimental evidence.

The exact calculation of balanced rations, J. T. WILLARD (*Kansas Sta. Bul. 115, pp. 97–146*).—According to the author, "the bulletin maintains, and the method of calculation is based upon the fact, that, reduced to a final analysis, the balancing of a ration consists in balancing the feeds used in it two by two. In this pairing, any one of the feeds may be used more than once, and the several quantities of a feed so used are finally added together to obtain the total sum. Recognition of the compound nature of this sum is essential to an understanding of the theory of the balancing of rations."

The method of calculating balanced rations, on the basis of the protein, fat, and carbohydrate content, is described and a method suggested, regarded as ample for practical requirements, which takes into account only protein and nonnitrogenous constituents. In addition a table is given which shows the relative amounts of a number of feeds, arranged in pairs, which must be used to approximate the nutritive ratios called for by the commonly accepted feeding standards. Figures are given for 14 different ratios. In the author's opinion "the mixtures given may in many cases constitute a ration; in others, a ration may be compounded by using, in any proportion desired, any of the various mixtures having the same nutritive ratio."

Stock raising (*Bul. Maine Dept. Agr., 1 (1902), No. 3, pp. 83–118*).—A number of articles by different authors on problems connected with stock feeding are included, as well as data recording local crop conditions, based on statements received from a number of correspondents in different parts of the State.

Concerning the estimation of starch and the digestibility of carbohydrates, S. WEISER and A. ZAITSCHEK (*Arch. Physiol.* [*Pflüger*], *93* (*1902*), *No. 3–4, pp. 98–127*).—The authors studied the estimation of starch in the presence of pentosan, the estimation of carbohydrates in feces, and the digestibility of the different constituents of the carbohydrate group with different farm animals. Starch in feeding stuffs was estimated by heating the material in autoclaves for 4 hours, inverting with hydrochloric acid, neutralizing and determining the amount of reducing sugars with Fehling's solution. A correction was introduced for the pentosan which was also converted into reducing substances, the amount being learned by determining the amount of furfurol-yielding material in a suitable sample after heating in the autoclave and assuming that it had a reducing value equal to that of dextrin. The reducing body the authors consider to be a mixture of arabinose and xylose, and the reducing value was assumed to be the same as that of dextrose, since experiments, reported in detail, show that arabinose had somewhat less and xylose somewhat more reducing power than dextrose, and that these values were not changed by the proportions in which the materials were present.

The authors' experiments led to the conclusion that starch in the feces of mammalia and birds can be estimated by the same methods as are used in the case of feeding stuffs, that is, without the addition of phosphotungstic acid or other precipitant. Using the methods described, analyses are reported of the feeding stuffs used in their experiments with different animals (meadow hay, broom corn seed, oats, maize, and fodder beets), as well as determinations of the carbohydrates in the feces of the animals.

The experiments reported were made with a horse, a duck, and steers, pigs, sheep, and geese. The rations consisted of different mixtures of the feeding stuffs enumerated and the results showed the digestibility of the different members of the carbohydrate group, especially crude fiber, starch, and pentosans. The average coefficients of digestibility obtained with the different classes of farm animals follow:

Average coefficients of digestibility of carbohydrates.

	Cellulose.	Starch.	Pentosans.	Undetermined material.	Total nitrogen-free extract.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Steer	56.0	96.6	63.4	44.8	74.7
Sheep	55.1	89.4	53.6	32.9	68.5
Horse	40.6	93.1	45.5	42.3	71.1
Swine	22.8	98.3	47.9	28.0	85.6
Poultry		87.9	23.9		

The authors conclude that determining the coefficients of digestibility of the constituents of the nitrogen-free group shows much more clearly the true digestibility of this portion of feeding stuffs than the method commonly followed.

Corn as a stock food, H. J. WATERS (*Missouri Sta. Circ. of Information 11, pp. 42, figs. 4*).—The chemistry of corn and the importance of the corn crop for farm animals, including poultry, are discussed. The results of several experiments carried on at the station on the possibility of increasing the value of corn stover by combining some such material as clover, cowpea hay, or alfalfa, and the comparative value of such a mixture and timothy hay are briefly reported. It was found that yearling steers, on timothy hay alone, consumed 21.7 lbs. feed per day per 1,000 lbs. live weight as compared with 25.2 lbs. whole-corn stover and clover hay 1:1. The gains during the feeding period, 74 days, on the 2 rations were 30.8 and 58.4 lbs., respectively. Similar results were obtained when shelled corn was added to the ration. Four yearling steers fed 4 lbs. of corn per day, in addition to timothy hay, made an average daily gain of 0.64 lb. per head for 104 days. On a ration of corn, clover hay, and corn stover an average daily gain of a similar lot was 0.88 lb.

In a second test, under practically the same conditions, 4 steers fed 6 lbs. of corn per head daily, in addition to timothy hay, made an average daily gain of 1 lb. per head for 80 days, while steers fed the same amount of corn in addition to clover and corn stover gained 1.35 lbs.

During a period of 119 days 4 steers on a full feed of shelled corn with timothy hay made an average daily gain of 1.69 lbs., as compared with 1.94 lbs. made by a similar lot in the same time on a corn, clover hay, and corn stover ration. In a similar test, also made with 2 lots of 4 steers each, covering 105 days, the relative gains were 1.97 and 2.85 lbs.

"Thus it appears in every case, whether fed without grain, with a small allowance of grain, or on full feed, whether with yearlings or aged cattle, a combination of corn stover and clover hay proved superior to timothy hay. In other words, the farmer is able by this means to make the stover serve every purpose, in cattle feeding at least, for which timothy is now used. Under these circumstances it is fair to say that timothy and stover have at least equal feeding values. It is quite probable that where such hays as clover, alfalfa, and cowpeas are not available, a small quantity of cotton-seed meal, linseed meal, gluten meal, or bran may serve the same purpose and accomplish the same result, viz, of enabling the feeder to use his stover to the best possible advantage, and as a complete substitute for timothy. It is needless to say that the accomplishment of this result would be attended by an immense increase in the net returns from the corn crop."

Two tests on the comparative merits of shredded or cut stover as compared with whole-corn stover are also reported. On an average yearling steers ate 25.8 lbs. of whole stover per head daily as compared with 20.6 lbs. of the shredded stover. Considering the tests as a whole, there was no gain or loss on the former ration while there was a loss of 11.6 lbs. on the latter. Nearly as much of the shredded stover as of the whole stover was left uneaten, the percentage being 36 for the former and 40.6 for the latter.

"In no case did the steers do as well on the shredded as on the whole stover, and in every instance the whole stover was more palatable. This appears to be accounted for by the fact that when the material is offered in its natural condition the animals have an opportunity to select the portions they prefer and discard the coarser and unpalatable parts, whereas in the case of the shredded stover the blades, husks, etc., are so intermingled that no opportunity is offered for selection.

"It must be conceded that when the corn can be husked and the stover shredded at practically the usual cost of husking the corn, the practice must commend itself to every farmer on account of the greater convenience with which the material may be fed and the preservation of the material in the mow or rick. But to be at the expense of shredding the stover after the corn is husked would in all probability be unprofitable."

Other problems connected with corn feeding are also discussed on the basis of experiments at the Missouri and other stations.

Some lessons from cattle-feeding experiments, F. B. MUMFORD (*Bul. Missouri State Bd. Agr., 2 (1902), No. 9, pp. 3–10*).—The cost of producing a pound of beef, the conditions influencing economy of gain, the value of nitrogenous coarse fodders, pasturage, winter and summer feeding, and related topics are discussed with especial reference to the work of the Missouri and other stations. Comparing different kinds of coarse fodder the Missouri Station found that with a lot of 4 steers on a full feed of shelled corn and timothy hay the average daily gain was 1.69 lbs. for 100 days. In the same time with a similar lot on corn and cowpeas the average daily gain was 2.64 lbs.

Environment and heredity, two great factors in cattle breeding, B. GARBERT (*Missouri State Bd. Agr. Mo. Bul., 2 (1902), No. 9, pp. 13–17*).—The general principles of the subject are summarized.

Concerning the metabolism of ruminants, J. HUTH (*Inaug. Diss., Univ. Bonn, 1902, pp. 82*).—A 2-year-old sheep was the subject of experiments which are reported in detail. The feed and excretory products were analyzed and the respiratory quotient was determined while the animal was fasting, feeding, and during the period in which the digestive processes were active. In one of the tests the ration consisted of meadow hay, in another of green alfalfa, and in the third of meadow hay and tropon by-products, salt and water being given with the first and third rations in addition. The digestibility of these rations is reported. According to the author the amount of oxygen absorbed from the air and the carbon dioxid produced is greater when feed is consumed and during the period in which the processes of digestion are active than when the animal is fasting. From the data recorded the energy balance is calculated and the conclusion drawn that with ruminants there is no difference in the amount of labor required for chewing and digesting hay and green feed.

Sheep feeding in Montana, R. S. SHAW (*Montana Sta. Bul. 39, pp. 15*).—The importance of the sheep feeding industry under local conditions is urged. Methods of feeding are described, the results of the station experiments in this direction being briefly noted.

Report of an experiment for ascertaining the influence of various manures upon the production of mutton, W. ASHCROFT (*Jour. Bath and West and Southern Counties Soc. [England], 4. ser., 7 (1901–2), pp. 182, 183*).—Brief notes are given of a test in which sheep were pastured on plats manured in different ways.

Thrift, the great essential in sheep feeding, J. ZIEGLER (*Missouri State Bd. Agr. Mo. Bul., 2 (1902), No. 9, pp. 18–21*).—Sheep feeding is discussed with special reference to the author's experience.

Pork production in Montana, R. S. SHAW (*Montana Sta. Bul. 37, pp. 10, pls. 2*).—Methods of pig feeding are discussed with special reference to Montana conditions, earlier work at the station being quoted (E. S. R., 14, p. 74).

The importance of sugar beets supplementing the grain ration was tested with 2 lots, each containing 4 pigs. The lot fed grain gained on an average only 1.58 lbs. each daily during 50 days, the cost of a pound of gain being 4.6 cents. The lot receiving grain with sugar beets in addition gained on an average 1.64 lbs. daily, the cost of a pound of gain being 3.8 cents. The former were given a heavy grain ration of 9.11 lbs. per day and the latter a ration of 6.65 lbs. of grain and 4.58 lbs. sugar beets per head per day. It was calculated that in this test there was a net profit of $14.12. An earlier test is also noted (E. S. R., 13, p. 274).

Experiments on the effect of time of drinking water upon the digestibility of feed, F. TANGL (*Landw. Vers. Stat., 57 (1902), No. 5–6, pp. 329–358, 381–404*).—Using 3 horses as subjects the author studied the effect upon digestibility of drinking water before eating, after eating, and during a meal—that is, immediately after the grain portion of a ration and immediately before the coarse fodder. In most of the experiments the horses were fed oats and hay; in some cases hay alone, and in others oats and maize with chopped straw and hay. Experimental data are recorded in full. So far as could be observed the time of drinking did not have an effect upon the digestibility of a ration of grain and coarse feed. It seemed probable that when hay only was fed there was a slight advantage in watering after feeding. The time of drinking exercised a marked effect on the amount of water consumed and upon the amount of water excreted. The horses drank the greatest amount of water when it was given after feeding, and the least when it was supplied before feeding. This was especially noticeable in the morning, when water was sometimes refused if offered before feeding. The excretion of urine was directly proportional to the amount of water consumed. When it is desired to increase the excretion, the author recommends water after feeding. The method of watering had no effect upon the amount or qualitative composition of the feces. Body weight varied with the amount of water consumed. Though the methods of watering tested were regarded as equally good, circumstances may, in the author's opinion, make it necessary to adopt one or the other. Thus, after severe exertion water should be supplied before the feed. It is said that it is not desirable to change unnecessarily from one method of watering to another, as some animals do not appear to be altogether indifferent to such changes. It was found that whenever a change was made from watering after feeding to watering before, the appetite fell off for some days and the ration was not as readily eaten as formerly. A similar effect was not observed when the change was from watering before to watering after feeding, or from watering after to watering during meals, or when the change was in the opposite direction to the last. The author believes it possible that the method of watering before feeding, until the animal becomes accustomed to it, produces a certain feeling of satiety.

Contribution to the subject of the metabolism of inorganic material by horses, F. TANGL (*Landw. Vers. Stat., 57 (1902), No. 5–6, pp. 367–380*).—Two experiments, each made with 2 horses, are reported in which the balance of income and outgo of nitrogen, phosphorus, calcium, and magnesium was determined. In the first experiment the daily ration of each horse consisted of 8 kg. of hay, one horse drinking 19.6 kg. of water and the other 26.5 kg. In the second test the daily rations of the horses consisted of 5 kg. hay and 4 kg. of oats, the amount of water consumed by each being 17.3 kg. and 22 kg., respectively. During the 5 days covered by the first test the horses lost on an average 0.5 kg. and 0.63 kg., respectively, in body weight, and in the second test, which covered 6 days, there were corresponding losses of 0.45 kg. and 0.72 kg. The results of the experiments are shown in the following table:

Income and outgo of inorganic material.—Experiments with horses.

	Horse No. 3.				Horse No. 4.			
	Nitrogen.	Phosphorus.	Calcium.	Magnesium.	Nitrogen.	Phosphorus.	Calcium.	Magnesium.
Experiment 1:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*
In feed and water	109.28	11.74	36.38	11.23	109.28	11.74	36.72	11.33
In feces	50.70	11.83	21.31	7.80	52.91	11.85	21.84	7.85
In urine	70.39	0.06	14.38	3.34	68.11	0.13	14.11	3.46
Gain (+) or loss (−)	−11.81	− 0.15	+ 0.69	+ 0.09	−11.74	− 0.24	+ 0.77	+ 0.02
Experiment 2:								
In feed and water	183.08	24.50	27.23	14.86	183.08	24.50	27.44	14.92
In feces	48.30	23.07	17.23	11.09	53.45	23.50	18.66	10.70
In urine	102.16	0.79	8.10	3.44	90.65	0.47	7.69	3.59
Gain (+) or loss (−)	+32.62	+ 0.64	+ 1.90	+ 0.33	+38.98	+ 0.53	+ 1.09	+ 0.63

According to the author, the experiments show that there is a parallelism between the metabolism of nitrogen and phosphorus, and that even in the case of adult animals the amount of calcium retained in the body is not necessarily proportional to the amount digested. So far as could be observed the amount of water taken with the feed had no effect upon the metabolism or digestibility of the mineral constituents studied.

Experiments with poultry, O. M. WATSON (*South Carolina Sta. Bul. 74, pp. 6*).—Since one of the drawbacks to successful turkey raising is the loss of eggs due to turkeys making their nests a long distance from home, the possibility of inducing them to lay when confined in runs was studied with 2 lots, each containing 2 hens and 1 male bird. Bronze birds 2 years old in the one case and 3-year-old White Hollands in the other. Each lot was confined in a run 80 by 100 ft., 2 nests covered at the top to keep out the rain and partially hidden behind some brush being provided in each case. The turkeys were fed in the morning a mash of wheat bran and corn meal 1:1, with whole corn and wheat on alternate nights. Twice a week they were given ground bone and meat scrap and always had access to oyster shells. The Bronze turkeys laid 42 eggs from March 26 to April 22 and the White Holland 36 eggs from March 24 to May 4. At the end of the tenth day examination showed that 38 of the former and 27 of the latter eggs were fertile. Twenty-seven of the Bronze turkey eggs and 16 of the White Holland eggs hatched. During incubation the Bronze hens broke 4 eggs and the White Holland 6, all of which were fertile. It is stated that all the eggs which failed to hatch were laid during the first 2 weeks of the test.

Two tests are briefly reported on the most satisfactory breeds of chickens for broilers. In both tests 10 chickens of each of the following breeds and crosses were included: Barred Plymouth Rock, Silver Laced Wyandotte, Indian Game, Indian Game and Pit Game crossed with Barred Plymouth Rocks, and Barred Plymouth Rock and Silver Laced Wyandotte crossed with common hens. The feeding period covered 12 weeks, all the chickens being fed for the first week after they were hatched a bread made of corn meal and wheat bran and buttermilk; during the second week bread, beef scrap, and German millet; and from the third week until the close of the test bread, beef scrap, cracked corn, and cracked wheat with milk or buttermilk once a day in addition to green feed (rye, lettuce, rape, and kale).

In the first test the smallest gains were made by the Silver Laced Wyandotte crosses, weighing 40 oz. per chicken at the end of the twelfth week. The greatest gains were made by the Indian Game-Barred Plymouth Rocks, weighing 46 oz. In the second test the smallest gains were also made by the cross-bred Silver Laced Wyandottes, these chickens weighing 41 oz. at the close of the trial. The greatest gains were made by the Pit Game-Barred Plymouth Rocks, weighing 46 oz. According to the author "The Wyandotte, Indian Game and Plymouth Rock cross and Pit Game and Plymouth Rock cross showed a plump breast. The Pit Game and

Plymouth Rock cross, the Plymouth Rock and common cross, and the Wyandotte had most feathers. The Indian Game had very few feathers but was plump. The cost of feed per chicken to 8 weeks was 7.5 cts. The cost of feed per chicken to 12 weeks was 12 cts. The cost for feed when this experiment was made was unusually high. No account of green food given was kept."

Brief statements are made regarding remedies for some common poultry diseases.

Poultry experiments, J. H. Stewart and H. Atwood (*West Virginia Sta. Bul. 83, pp. 443-465, pls. 3*).—Beef scraps, ground fresh meat and bone, and milk albumen as sources of protein for laying hens were compared with 3 lots each containing 10 White Leghorn pullets, 10 two-year-old hens, and 2 cocks. All the lots were fed corn and oats, whole and ground, wheat and wheat bran. In addition lot 1 was fed the beef scraps, lot 2 the milk albumen, and lot 3 the ground fresh meat and bone during the first period of the test (120 days). During the second period, which was of equal duration, the grain ration was practically the same as before, but the animal feeds were reversed, lot 1 receiving the fresh meat and bone, lot 2 the beef scraps, and lot 3 the milk albumen. Throughout the test an attempt was made to feed practically the same amount of protein to each lot, but at no time were the fowls fed heavily.

At the beginning of the trial the hens weighed about 3.2 lbs. and the cocks not far from 4 lbs. During the first period slight gains were made. During the second period there was a small loss in nearly every case. In the first period the fowls receiving beef scraps laid 386 eggs, those fed milk albumen 228 eggs, and those fed fresh meat and bone 279 eggs. In the second period 987 eggs were produced on the beef scrap ration, 935 on milk albumen, and 947 on fresh meat and bone. The cost of feed per dozen eggs in the first period on the 3 rations was 17, 30.4, and 23.1 cts., respectively. In the second period the cost was 6.6, 7.3, and 6.8 cts., respectively.

"More eggs were laid by the fowls when fed beef scraps than when they received either ground fresh meat and bone or milk albumen. The health of the fowls remained uniformly good throughout the test, and the low egg yield was due partly to the fact that the houses in which the fowls were kept were not constructed warm enough for economical egg production during the winter, and partially to the fact that the fowls were not fed heavily at any time for egg production, as many of the eggs were incubated, and strong, vigorous chicks were desired." There was no material difference in the fertility of the eggs from the different lots.

In a test covering 2 periods of 60 days each, made with 5 lots, ground grain was compared with whole grain for the morning and evening ration of laying hens. Lots 1, 2, and 3 were composed of 20 White Leghorn hens and 2 cocks nearly 1 year old at the beginning of the trial. Lots 4 and 5 each contained 20 White Leghorn hens and 2 cocks about 4 years old. The grain ration consisted of corn and oats, unground and ground, the latter being made into a mash with water. Some dry beef scraps were given to the chickens receiving whole grain, and were mixed with the mash of the other lots. During the first period lot 1 received whole grain scattered in the litter in the morning, and mash at night; lots 2 and 4 were fed mash in the morning and whole grain at night, and lots 3 and 5 were fed entirely upon whole grain. The younger fowls weighed about 3 lbs. at the beginning of the trial and the older fowls not far from 3.33 lbs. At the close of this period all the lots had lost a little in weight. The greatest number of eggs, 674, were laid by lot 2 (young fowls fed a mash in the morning), and the smallest number, 519, by lot 3 (young fowls fed whole grain). The total feed eaten per lot ranged from 269 lbs. with lot 1 to 274 lbs. with lots 4 and 5. The cost of feed per dozen eggs ranged from 5.4 cts. with lot 2 to 7 cts. with lot 3.

In the second period the rations were reversed in such a way that lot 2 was fed whole grain in the morning and mash at night, lots 3 and 5 a mash in the morning and whole grain at night, and lots 1 and 4 were given whole grain. Lot 2 neither gained nor lost in weight. The chickens in the other lots gained on an average from 0.02 lb. in the case of lot 4 to 0.16 lb. in the case of lot 1. The total feed eaten by lot 2 was 216 lbs. and by the other lots 215 lbs. each. The eggs laid ranged from 472 with lot 4 (fed whole grain) to 549 eggs with lot 2 (fed whole grain in the morning and mash at night). The cost of feed per dozen eggs ranged from 5.2 cts. with lot 2 to 6.1 cts. with lot 4. Some of the authors' conclusions follow:

"In this experiment the egg production was practically the same when the mash was fed in the morning as when fed at night. With both young and old fowls better results were obtained when about one-third of the grain ration was fed ground and moistened than when all of the grain was fed whole and scattered in the litter. During the test the average food-cost of the eggs laid by the young fowls was 5.8 cts. per dozen, while with the older hens the cost was 6.3 cts. In this connection it should be remembered, however, that these fowls had a very restricted range, and that all of the food that they received was charged to them at full market rates."

In continuation of previous work (E. S. R., 13, p. 276) 2 tests were undertaken to determine the importance of keeping hens warm at night by means of curtains surrounding their perches, 2 lots, each containing 20 White Leghorn pullets and 2 cockerels, being used. Both lots were given a mash of ground feed each morning to which was added a small quantity of beef scraps, and at night were fed whole grain scattered in the litter which covered the floors. During the coldest nights of the test, when the temperature of the houses would fall nearly to the freezing point, lot 1 was protected at night with curtains. The average weight at the beginning of the trial was 2.72 lbs. At the close of the trial, which covered 120 days, the average weight was 3.2 lbs. Similar values for lot 2 were 2.66 lbs. and 3.14 lbs. The total egg production for the 2 lots was 334 and 358 eggs, respectively. The cost of feed per dozen eggs was 16.8 cts. and 15.6 cts. Practically the same amount of feed was eaten by the 2 lots, namely, 120 lbs. of corn, 125 lbs. of wheat, 83 lbs. of oats, 23 lbs. of beef scraps, and 28 lbs. each of corn meal, brown middlings, and ground oats.

The second test was made with 2 lots each containing 15 Barred Plymouth Rock pullets and 1 cock. The space shut in by curtains was larger than before, being 90 cu. ft., or about 5.5 cu. ft. per fowl. The test began November 1 and covered 120 days, during which lot 1 (protected at night) laid 244 eggs and lot 2 laid 247 eggs. According to the authors, "during 18 days, beginning January 4, the temperature of the roosting places was taken at night by means of maximum and minimum thermometers. The average of the lowest temperatures for the cold house was 35.5° and within the curtains 41.5°. The results of both of these tests are unfavorable to the use of curtains in this climate."

The Van Dreser method of producing an early and uniform molting was also studied. In brief, this method consists in withholding feed wholly or in part for a few days to stop egg production and reduce the weight of the fowls, and then feeding heavily a ration suitable for the formation of feathers and the general upbuilding of the system. Four lots of 20 hens and 2 cocks each about 2 years old were included in the trial, 2 of the lots being Rhode Island Reds and 2 White Leghorns. One lot of Rhode Island Reds (lot 1) and 1 lot of White Leghorns (lot 3) were fed throughout the test an ordinary ration of grain mash, beef scraps, corn, wheat, and oats. The remaining lots received no feed for 13 days, except what they could pick up in their runs, which had been sown with oats in the spring. The runs were 100 feet long and 15 feet wide, and it is stated that nearly all the oats had been picked from the heads before the beginning of the test. Beginning with the third week these lots were fed a full ration similar to that of lots 1 and 3. During the first 30 days after the beginning of the trial lots 1 and 3 (fed continuously) laid 75 and 172 eggs, respectively. The other two lots laid, respectively, 17 and 25 eggs, ceasing to lay entirely on the seventh day. The authors state that 30 days after the test began the lot of Rhode Island Reds (given no feed for 13 days) "had practically a complete coat of new feathers, had begun to lay, and within a week from that time one-half of the hens were laying regularly, while the other lot of Rhode Island Reds were just beginning to molt and the egg production had dropped down to 2 or 3 eggs per day. Both lots of White Leghorns were a trifle slower in molting than the Rhode Island Reds, but otherwise the treatment affected them in a similar way."

For 10 days the dropping boards in the 2 White Leghorn houses were not cleaned. There were comparatively few feathers in the droppings from the lot fed continuously, while a very large number were found in the droppings of the fowls fed by the Van Dreser method. According to the authors' summary—

"Mature hens which are fed very sparingly for about 2 weeks and then receive a rich nitrogenous ration molt more rapidly and with more uniformity, and enter the cold weather of winter in better condition, than similar fowls fed continually during the molting period on an egg producing ration."

Commercial feeding stuffs in the Connecticut market, E. H. Jenkins et al. (*Connecticut State Sta. Bul. 141, pp. 60*).—According to the provisions of the State feeding stuff law, analyses are reported of a number of samples of cotton-seed meal; linseed meal, old and new process; bran and middlings from winter and spring wheat; mixed feed from spring and winter wheat, and unclassified; corn meal, gluten meals and feeds, hominy feeds; rye bran, rye feed; malt sprouts, brewers' grains; ground oats, oat feed; buckwheat middlings and hulls; peanut bran, broken peanuts, distillers' grains, and a number of miscellaneous mixed feeds; proprietary feeds; cereal breakfast food by-products; poultry feeds; damaged breakfast foods (offered for sale as cattle feed), and calf meal. According to the authors—

"The composition of most of the feeds which have guaranties is in substantial agreement with these guaranties. The only evidence of deliberate fraud in the feed market which is shown by the analyses is the mixing of finely ground corn-cob or corn bran with mixed wheat feed, and selling this mixture in packages which do not bear the name of the manufacturers nor any statement giving the composition of the mixture."

The digestibility of feeding stuffs and some other general topics are discussed.

Slaughtering and meat packing, H. C. McCarty (*Twelfth Census United States, Census Bul. 217, pp. 45*).—Statistics are reported of the geographical distribution, the condition at the present time, and the growth of the slaughtering and packing industry. The reports show a capital of $189,198,264 invested, and an annual value of products of $785,562,433.

Wool manufactures, W. J. Battison (*Twelfth Census United States, Census Bul. 236, pp. 125*).—Statistics are given showing the present condition of wool-manufacturing industries, the amount of imports and exports, the geographical distribation of the mills, the proportional amount of different manufactured products, and related topics. The annual value of the manufactured products is estimated at $392,473,050.

DAIRY FARMING—DAIRYING.

Experiments with dairy herd, A. L. Haecker (*Nebraska Sta. Bul. 76, pp. 21, figs. 6*).—*The herd record* (pp. 3–13).—During the 5 years from 1897 to 1901 the dairy herd comprised from 7 to 14 cows each year. The annual production of each cow is given. The average yields of milk, fat, and estimated butter for the 52 lactation periods reported were, respectively, 5,833.17, 270.7, and 315.82 lbs. One cow, a grade Jersey, produced on an average during the 5 years 7,377.68 lbs. of milk and 316.25 lbs. of fat, while another cow of similar breeding but different in form produced only 1,278.76 lbs. of milk and 52.77 lbs. of fat during the one year in the herd.

Ration tests for dairy cows (pp. 14–18).—Twelve cows were divided into 2 equal lots and fed experimentally for 2 periods of 6 weeks each. Alfalfa hay was fed ad libitum to lot 1 during the first period and lot 2 during the second period, and wild grass hay was fed in the same manner during the alternate periods. Both lots were fed a uniform ration of grain and beets. On alfalfa hay the 12 cows produced 9,862.74 lbs. of milk and 511.47 lbs. of butter, and on wild hay 9,722.49 lbs. of milk and 502.07 lbs. of butter, showing a difference of 140.25 lbs. of milk and 9.40 lbs. of butter in favor of alfalfa.

A comparative test was also made of corn silage and sugar beets fed in equal amounts in connection with a uniform ration of alfalfa hay and grain. The test was made with 2 lots of 5 cows each and lasted 5 weeks. The difference in production of the 2 lots for the 5 weeks previous to the test when both were fed silage was 129.2 lbs. of milk and 5.7 lbs. of butter, and the difference during the 5 weeks of the test, when one lot was fed silage and the other lot sugar beets, was 221.4 lbs. of milk and 10 lbs. of butter, the results being in favor of silage. "While corn silage gave slightly better results than sugar beets when fed to dairy cows, the difference was so small that it is safe to say they are quite equal in feeding value."

The best week in a cow's lactation period (pp. 19–21).—To obtain information on this subject 155 records from the Minnesota Station and 84 from the Nebraska Station were compiled. The results show that the greatest number of cows made their best yield of milk during the third week and their best yield of butter during the second week, the difference between the second and third weeks not being very great. The first week was calculated as beginning 4 days after calving.

Feeding the dairy cow, C. H. ECKLES (*Missouri Sta. Bul. 58, pp. 53–72*).—Based upon the results of practical feeding by dairymen and of scientific experiments, the author offers suggestions for feeding adapted to Missouri conditions. The subjects touched upon in the discussion include turning on pasture in the spring, grain feeding on pasture, providing for periods of short pasture, reasons for feeding balanced rations, buying concentrated feeds, grinding feed, computing rations, and the use of feeding standards. Several suitable rations are suggested.

Butter record of the Buckhold herd, H. WATNY (*Jour. Bd. Agr.* [*London*], *9* (*1902*), *No. 3, pp. 312–319*).—The herd comprised 46 cows during the year ended September 30, 1902. The average annual production of 29 cows remaining in the herd for the whole year was 450.8 lbs. of butter per cow.

Milking and butter test trials, E. MATHEWS (*Jour. Bd. Agr.* [*London*], *9* (*1902*), *No. 3, pp. 297–306*).—This is a brief account of milking trials which have been conducted in England during the last 25 years, and of butter test trials first held in 1886, with a discussion of some of the results obtained.

On the influence of feeding on the composition of the fat of milk, B. SJOLLEMA (*Proc. Sec. Sci., Koninkl. Akad. Wetensch. Amsterdam, 4* (*1901–2*), *pp. 746–756, pl. 1*).—The author studied the influence of feeding sugar-beet tops, sugar, and molasses upon the index of refraction and the content of volatile fatty acids of the butter fat. The feeding of sugar-beet tops as tested with 4 cows on pasture during one month apparently caused an increase of about 8 in the average Reichert-Wollny number and a decrease of about 6 in the refraction number of the butter fat. The fat content of the milk was somewhat increased. In another test made with 3 cows in the stable and lasting about 1 month, raw sugar in daily amounts varying from 0.4 to 2 kg. was estimated as increasing the Reichert-Wollny number of the butter fat from 2 cows 4.7 and 5.95, respectively, as compared with the Reichert-Wollny number of the butter fat from the control animal. In a similar test with molasses and sugar the increase in the Reichert-Wollny number was nearly as marked, the conclusion being drawn from the last 2 experiments that sugar exercises a considerable influence on the increase of the volatile fatty acids in butter fat.

On the composition of cows' milk, H. C. SHERMAN (*Jour. Amer. Chem. Soc., 25* (*1903*), *No. 2, pp. 132–142, fig. 1*).—The mixed milk of a herd of about 600 pure-bred and grade Jerseys was sampled monthly for the 2 years beginning April, 1900, and analyzed to determine seasonal variations in composition. The samples were all of the afternoon milk which had been found by frequent tests to contain quite regularly 0.4 per cent more fat and practically the same percentage of solids-not-fat as the morning milk. The percentages of milk sugar and ash were found to remain nearly uniform throughout the year, while the percentages of protein as well as of fat showed a seasonal variation, being higher in the fall and winter than in the spring and summer. A comparison of the results with analyses reported by Van Slyke and by Richmond showed a close agreement, the fat and solids-not-fat having a tendency in each case to rise and fall nearly together. The average composition of the milk for the 2 years was as follows: Total solids 14.71, fat 5.26, solids-not-fat 9.25, protein 3.66, milk sugar 4.84, and ash 0.75 per cent.

During the same period analyses were also made of the milk of individual cows and of certain groups of cows for the purpose of studying variations in other constituents than fat. The average composition of 13 unusually rich samples was as follows: Total solids 18.03, fat 7.76, solids-not-fat 10.27, protein 4.68, milk sugar 4.76, and ash 0.83 per cent. The average composition of 6 samples low in solids-not-fat was as follows: Total solids 11.53, fat 3.90, solids-not-fat 7.63, protein 3.34, milk sugar 3.59; and ash 0.71 per cent. "All of the results obtained accord with the conclusion recently reached by Richmond that any deficiency of solids-not-fat is chiefly due to a deficiency in the milk sugar, while any excess above 9 per cent is chiefly due to an excess of protein."

The following statements are made as regards the relation of protein to fat and to ash: "The data at present available indicate that aside from the seasonal variation already noticed, the percentages of fat and protein tend to rise and fall together, though not to the same extent; that the average relation between the two is approximately expressed by the formula, protein $=2+\frac{1}{3}$ fat, but that the protein often shows less variation from the average than this formula would imply. . . . In practically all of the samples examined the relation between protein and ash was very nearly that found by Richmond and expressed by the formula, ash $=0.36+0.11$ protein. To agree more exactly with our averages, the formula may be modified to read ash $=0.38+0.1$ protein." The milk sugar showed no tendency to vary with any other constituent.

Pasteurization of milk in bottles with agitation, N. Gerber and P. Wieske (*Rev. Gén. Lait, 2* (*1903*), *No. 8, pp. 169–177*).—It is stated that a method of pasteurizing milk in bottles subjected to constant shaking has been in practical use by Gerber for 15 years. The advantages of the method are set forth in this article and recent literature relating to standards of pasteurization is reviewed. The method is designated the Gerber method of pasteurization with agitation, and differs from other methods in that during heating and cooling the apparatus containing the bottles of milk is maintained in continuous oscillatory motion. The milk is thereby heated uniformly and the formation of a surface membrane is prevented. By this process, which is considered more rapid and economical than pasteurization without agitation, the milk is said to be left in a better condition as regards color, taste, and odor, and there is less separation of the cream. Bottles containing as much as ½ liter may be used. Until lower temperatures are justified by further investigations the authors favor pasteurization at 65° C. for 30 minutes to 1 hour.

Comparative tests of different methods of distinguishing raw and heated milk, G. Mullie (*Rev. Gén. Lait, 2* (*1902*), *Nos. 4, pp. 77–86; 5, pp. 100–108; 6, pp. 128–133; 2* (*1903*), *Nos. 7, pp. 149–152; 8, pp. 178–182; 9, pp. 200–209*).—Numerous methods which have been proposed for the detection of heated milk are classified and described, and the results of tests by the author are given in connection with the discussion of each method. A bibliography is appended. Certain simple and easily made tests based upon color reactions are considered as showing conclusively whether milk has been heated to 78 to 80° C., at which temperature the danger from pathogenic germs is practically eliminated. Chemical methods based upon determining the absence of lactalbumin serve to determine if milk has been heated to 80 to 85°, but the methods are not so suitable for practical purposes. Some of the methods are considered satisfactory in recognizing mixtures of raw and heated milk.

The hygienic differentiation of market milk and its derivatives by biological methods, V. Sion and N. Laptes (*Ztschr. Fleisch. u. Milchhyg.*, *13* (*1902*), *Nos. 1, pp. 4–7; 2, pp. 33–37*).

Milk, H. de Rothschild (*Le lait. Paris: Octave Doin, 1903, pp. 90*).—This little book deals with pasteurization as applied to the dairy, the pasteurization and sterilization of milk, methods of analysis, and milk adulteration. A brief bibliography is appended.

The bacterial flora of freshly drawn milk, F. C. Harrison and M. Cumming (*Jour. Appl. Micros. and Lab. Methods*, *5* (*1902*), *Nos. 11, pp. 2029–2038; 12, pp. 2086, 2087; 6* (*1903*), *Nos. 1, pp. 2130, 2131; 2, p. 2181*).—The résumé which is given of the literature of this subject shows that decidedly different results have been obtained by various investigators. In the experiments reported by the authors samples of the fore and after milk of a number of cows were carefully collected in sterile test tubes and studied as regards the number and species of bacteria present. Great variations were observed in the numbers of colonies which developed on gelatin plates. The results of a large number of determinations showed on an average from 25,000 to 50,000 bacteria per cubic centimeter in the fore milk. The number in the strippings varied from none to 57,000 per cubic centimeter, varying greatly with the rapidity of taking the sample.

The several species found constantly present in the milk of all the cows were systematically studied as were also all the species found in the milk of one cow. Owing to their characters being so slightly marked, except in the case of *Bacillus acidi lactici*, the identification of the different species was difficult. Three lactic acid bacteria, *Bacillus acidi lactici* (Nos. 206 and 202 of Conn) and *B. lactis aerobans* (Conn 197), were the only species found in all the samples and they comprised at least 95 per cent of the bacteria present. The following species, of which descriptions are given, were more or less variable in their presence: *Bacillus halofaciens* n. sp., *Micrococcus varians lactis*, *Bacillus 18* of Conn (?), *Bacillus VII*, *Bacterium VIII*, *Bacterium exiguum*, and *Micrococcus X*. All the species described were facultative anaerobes. The optimum temperature for growth was 37° C. Conditions existing in the udder were therefore probably favorable to their growth. The anaerobic faculty was especially marked in the case of the lactic-acid bacteria, which accounts for their preponderance over the other species.

Udders were inoculated with *Bacillus prodigiosus*, *B. exiguum*, and *B. fluorescens liquefaciens* by smearing the ends of the teats with cultures. The bacilli soon disappeared from the milk.

Cultures were made from the livers and udders of 3 cows which had been dry for several weeks previous to slaughter. Bacteria were found in the livers of all 3 and in the udders of 2 cows. While the results are not considered sufficient to warrant a positive assertion they point toward infection by way of the blood or lymph rather than through the teat.

"In reviewing the subject, there can be no doubt that the number of bacteria present in the milk as it exists before being drawn from the udder is somewhat startling, and were nothing more than an enumeration of the germs given there might be some occasion for alarm. However, a systematic study of the germs proves that with the possible exception of rare cases, this source of bacterial life is much more beneficial than baneful to the average consumer of milk and its products."

The bibliography given includes 25 references.

Improved method of studying milk bacteria, H. W. Conn and W. M. Esten (*Rev. Gén. Lait*, *2* (*1903*), *Nos. 9, pp. 193–200; 10, pp. 224–233*).—The authors have endeavored to devise a method for determining with rapidity and with some degree of accuracy the numbers of the different species of bacteria in milk. For this purpose two culture media have been used, one prepared like ordinary gelatin with the addition of milk sugar and litmus, and one prepared by the addition of 15 per cent of gelatin to whey. The gelatin medium gives a larger number of colonies and the whey medium a sharper differentiation of the different kinds. Plate cultures are made, the sample of milk being diluted with sterile water to such an extent that from 200 to 300 colonies develop on each. The degree of dilution varies ordinarily from 50 to 600 in moderately fresh milk and frequently above 200,000 in milk which has been kept warm for 2 or more days. The cultures are kept at about 20° C. for 5 or 6 days, when the total number of colonies is determined and a study is made of the different kinds as recognized by their appearance, the number of each type being ascertained. No subsequent cultures are made. The authors have found it possible in this way to differentiate accurately a large variety of colonies, several of the more important of which are briefly described. The colonies are considered as representing groups of species rather than as necessarily representing individual species. This method of identifying the different species and determining approximately their number, while not regarded as very accurate, has the advantage of being rapid and of permitting observations to be made on the rise and fall of different types of bacteria in milk in a way not hitherto considered possible.

Bitter milk and cheese, F. C. HARRISON (*Ontario Agr. Col. and Expt. Farm Bul. 120, pp. 32, figs. 7*).—This has been noted from another source (E. S. R., 14, p. 489).

The percentage of water in Canadian creamery butter, F. T. SHUTT (*Ontario Dept. Agr., Dairy Division Bul. 4, n. ser., 1902, pp. 6*).—Determinations were made of the water content of 75 samples of butter received from creameries in different parts of Canada and of 30 samples obtained in Montreal from packages ready for export. The butter was practically all manufactured in July and August, and was considered representative of the butter prepared for export to England. The maximum, minimum, and average water content of the samples from creameries was, respectively, 16.77, 8.92, and 12.16 per cent, and of the warehouse samples 15.37, 7.94, and 12.69 per cent. Of the 105 samples 92 showed less than 14 per cent of water. Only 1 sample contained more than 16 per cent and this was of butter churned above 60° F. and washed at 64°, temperatures noted as unusually high in Canadian creamery practice. The results are considered as fairly conclusive evidence that Canadian creamery butter is well within the limit of 16 per cent allowed by the English law. As regards the relation of the water content to inspection rating the author states that "the appearance of a butter as sampled affords, generally speaking, no criterion as to its moisture content."

Control of rusty spot in cheese factories, H. A. HARDING and G. A. SMITH (*New York State Sta. Bul. 225, pp. 303-329*).—The trouble known as rusty spot manifests itself in cheese from 4 to 8 days after pressing and is characterized by the occurrence throughout the interior of the cheese of bright red or yellowish-red spots the size of a pin point and larger. The time of their appearance is hastened by a warm curing room and retarded by a cool one. The spots are usually most noticeable on the surface of gas holes and other openings, where in the presence of free moisture they may form a yellowish-red blotch the size of a thumb nail. The trouble is most evident in moist cheese made for home trade. The whole interior of the cheese may in bad cases present an unevenly colored appearance. The use of cheese color is not entirely successful in disguising the rusty spots. Outbreaks have occurred in nearly every section of the State where white cheese is made, and have been reported since 1883. In an earlier bulletin of the station (E. S. R., 13, p. 85) this subject was briefly discussed and the causal relation of *Bacillus rudensis* was confirmed. Experiments made at 4 factories during 1901 and 1902 for the control of this trouble are recorded in detail in the present bulletin.

The disinfection of factories by the use of steam was the method employed, the results showing that the thorough application of this treatment three times per week will prevent financial loss except under very unusual conditions. "In attempting to combat this trouble in any factory the first step is a thorough cleaning up o' the factory and its surroundings. A few loads of gravel will do away with the mud by the weigh can and the whey tank, and good drainage should be provided for the factory waste. The walls and ceiling of the room in which the cheese is made should be cleaned and preferably whitewashed, and the floor scrubbed with hot lye. The weigh can and all the utensils which come in contact with the milk should be steamed thoroughly three times per week. This can be best accomplished by placing the utensils in a vat, drawing a heavy canvas cover tightly over the top, and turning in the steam. In 5 minutes the heat should be up to 180° F. in all parts of the vat, and 15 minutes more above this temperature will suffice. The weigh can is best treated by inverting and turning in the steam for 20 minutes through the faucet. The heating of the all-metal cheese hoops can be carried out according to the same plan, but Frasier hoops present some difficulties. The accumulation of fat in the crevices makes a special place for heating desirable, and our experience in heating the wooden followers is not sufficient to justify us in recommending it as a regular procedure, although heating occasionally does not seem to be harmful. The observations given in connection with [one] factory indicate that heating these followers is desirable. Considered both as a means of preventing the return of a considerable number of *Bacillus rudensis* to the farms, and as a means of holding the whey sweet and in first-class condition for feeding, the heating of the whey to 160° F. is desirable."

Considerable work was done to determine the source of contamination, with results not entirely conclusive. The original source of infection was not determined in any case. "While under ordinary conditions the factory seems to be the main seed bed of the germs, cheeses made from the milk of individual patrons indicate that at times the milk of some patrons contains the germs causing rusty spots."

Ripening of cheese in cold storage compared with ripening in the ordinary curing room, H. H. Dean, F. C. Harrison, and R. Harcourt (*Ontario Agr. Col. and Expt. Farm Bul. 121, pp. 12, fig. 1*).—The experiments reported in this bulletin were made during the period from April to November, 1901. The temperature of the cold-storage room during the season averaged 37.8° F. and the humidity 91.6 per cent. The average temperature of the ordinary curing room was 63.8° and the humidity 79.1 per cent. In each of the 26 experiments conducted 4 or 5 cheeses of about 30 lbs. each were made. Cheese A was immediately placed in cold storage; cheeses B, C, and D were placed for 1, 2, and 3 weeks, respectively, in the ordinary curing room and then transferred to cold storage; cheese E was ripened in the ordinary way.

Cheese in the curing room ripened about as much in one week as cheese in cold storage did in one month. At the end of 86 days the numbers of lactic-acid bacteria in the cold-storage and curing room cheeses were, respectively, seven-eights and one-fortieth of the numbers present at the beginning of the ripening period. "The significance of this fact is that there is little chance for undesirable bacteria to produce bad flavors in the cold-storage cheese owing to the large number of the lactic-acid bacteria, the proportion of the lactic-acid bacteria to certain undesirable kinds being much greater than is usual under ordinary conditions."

During the first month the loss in weight was as follows: Cheese A 2.1, B 2.8, C 3.2, D 3.6, and E 4.4 per cent. The averages of all scorings made by months during the season were as follows: Cheese A 92.4, B 91.6, C 90.9, D 90.7, and E 85 per cent. The cheeses ripened in cold storage were especially uniform in quality. Such cheese was not observed as spoiling quickly when exposed to ordinary temperatures. Mold, which was equally troublesome in the refrigerator and the curing room, was kept in check by the use of formalin.

"At present, we are not prepared to say that all cheese should be ripened in cold storage; but we certainly think that cheese made during the hot weather, say in the months of July and August, should be placed in cold storage as soon as possible after they are made." The investigations are being continued.

Plans and specifications of a cool cheese-curing room, J. A. Ruddick (*Ontario Dept. Agr., Dairy Division Bul. 7, n. ser., 1903, pp. 29, dgms. 8*).—The plans provide for office, testing room, store room, etc., in connection with the curing room, and are intended to illustrate the system of insulation and cooling rather than to serve as a model as regards size and arrangement. The cooling is secured by means of ice. No difficulty was experienced at the Brockville curing room in maintaining a temperature between 54 and 60° F. from June 18 to September 30 by the use of 100 tons of ice, during which time 6,644 cheeses were received.

Fourth report of the State Dairy Bureau, 1900–1902 (*Rpt. California State Dairy Bureau, 4 (1900–1902), pp. 56*).—This contains a review of the work of the Dairy Bureau during the 2 years ended October 1, 1902, statistics of the dairy industry in California, analyses of a number of samples of butter and cheese, lists of creameries and cheese factories in California, and the State dairy laws.

Dairying division, J. A. Kinsella (*New Zealand Dept. Agr. Rpt. 1902, pp. 135–218, pls. 5*).—This is a report on the progress of the dairy industry in New Zealand during the year and on dairy conditions in Australia as observed by the author. Statistics are given of the amount and value of butter and cheese exported from New Zealand, and numerous suggestions are made as regards methods of making butter and cheese, grading dairy products, building and equipping factories, testing cows, etc.

VETERINARY SCIENCE AND PRACTICE.

The microbic diseases of animals, E. Nocard and E. Leclainche (*Les maladies microbiennes des animaux. Paris: Masson & Co., 1903, vols. 1, pp. 668; 2, pp. 645*).—The present edition of this work has been entirely rewritten and considerably enlarged. Some chapters required but little change while it was found possible to contract the discussion of certain other subjects. A number of new subjects have been introduced, among which the more important are the diseases due to hematozoa, actinobacillosis, pseudotuberculoses, fowl plague, horse disease, canine typhoid, and pasteurelloses of horses and calves.

Manual of veterinary medicine, E. Courtenay (*London: Ballière, Tindall & Cox, 1902, 2. ed., pp. X+573*).—The present edition has been revised and edited in so far as was necessary by F. T. G. Hobday. The volume treats especially of the principal diseases of horses and cattle, and includes the following subjects: Diseases of the respiratory system, strangles, lymphangitis, skin diseases, eye diseases, nervous diseases, inflammation, diseases of the bones, wounds, diseases of the feet, teeth, stomach and intestines, liver, spleen, pancreas, and urinary system, glanders, variola, castration, pregnancy, azoturia, cardiac diseases, blackleg, and hog cholera.

Outlines of veterinary hygiene for veterinarians and students, F. Niemann and O. Profé (*Grundriss der Veterinär-Hygiene für Tierärzte und Studierende. Berlin: Louis Marcus, 1903, pp. 418, figs. 50*).—The purpose of this volume is to give a concise account of various subjects relating to the hygiene of domesticated animals. Unnecessary details are omitted in order that the book may be most convenient for use by practical veterinarians and sanitary officers. The volume contains an account of the hygiene of stables, and the care and feeding of animals. The greater part of the volume, however, is occupied with a discussion of animal plagues, methods of combating them, and veterinary bacteriology. One chapter is devoted to an account of knackers' establishments and methods for disposing of infectious cadavers.

Practical veterinary advice for stock owners, A. H. Archer (*London: Vinton & Co., Ltd., 1901, 2. ed., pp. 83*).—The purpose of this volume is to assist stock owners in maintaining their animals in healthy condition. The more important diseases of domestic animals are described and information is given which will enable owners to deal with such cases. The various diseases discussed are classified according to the part of the body affected. The author discusses also the nature of simple operations and gives a list of drugs, with the size of doses for various animals.

A treatise on surgical therapeutics of domestic animals, P. J. Cadiot and J. Almy, trans. by A. Liautard (*New York: W. R. Jenkins, 1902, vol. 1, pt. 3, pp. 189–328, figs. 33*).—This part of the translation of the French text-book on surgical therapeutics includes chapters on granulations, mycoses, tumors, diseases of the skin, serous membranes, muscles, and tendons. The purpose of the translation is to make available to American veterinarians a thorough account of the subject as presented in the French original.

Manual of bacteriology, R. Muir and J. Ritchie (*New York: The Macmillan Co., 1903, Amer. ed., pp. XX+565, figs. 170*).—This edition is revised and edited from the third English edition by N. Mac L. Harris. The general scope of the work has been somewhat enlarged and alterations have been made in certain chapters, especially chapters 2, 3, 4, 15, and 17. The section on bibliography has been considerably extended. The subjects treated in the volume include general morphology and biology of bacteria; methods of cultivation; microscopic methods; bacteria in air, soil, and water; fungi; relations of bacteria to disease; inflammatory and suppurative conditions; venereal diseases; tuberculosis; leprosy; glanders; actinomycosis; anthrax; typhoid fever; diphtheria; tetanus; malaria; influenza; immunity; smallpox; hydrophobia; malarial fever; amœbic dysentery, etc.

Annual report on investigations in the field of veterinary medicine, Ellenberger et al. (*Jahresber. Leist. Geb. Vet. Med., 21 (1901), pp. 312*).—In this report the authors have brought together brief references to the literature of veterinary science for the year 1901. The literature is classified in an elaborate system according to the subject-matter, the main features of some of the more important literature are briefly discussed, and reference to the literature is made easy by an author and subject index.

Veterinary science and its problems, O. Malm (*Tidsskr. Norske Landbr., 9 (1902), No. 7, pp. 304–320*).

Disinfection and disinfectants, M. J. Rosenau (*Philadelphia: P. Blakiston's Son & Co., 1902, pp. XII + 353, pls. 21, figs. 90*).—The purpose of this volume is to present in a brief and convenient form the practical methods of disinfecting after the presence of various infectious diseases of man and animals. The subjects discussed include physical disinfectants, gaseous disinfectants, chemical solutions, insecticides used in destroying insects which carry diseases, disinfection of houses, ships, etc., and specific directions for disinfecting after particular diseases.

Text-book of meat hygiene, with special references to inspection of food animals and meat, R. Endelmann (*Lehrbuch der Fleischhygiene, mit besonderer Berücksichtigung der Schlachtvieh- und Fleischbeschau. Jena: Gustav Fischer, 1903, pp. 336, pls. 2, figs. 172*).—In this volume the author discusses in a concise manner the history of meat inspection, traffic in animals used for food, morphology and chemical composition of important tissues and organs, means of preparing and preserving meat, legal regulations with regard to meat traffic and the organization and practice of inspection of food animals and meat, while the larger part of the volume is occupied with a discussion of the various diseases and post-mortem changes which come under the notice of the meat inspector. Chapters are also presented on the arrangement of slaughterhouses and cattle yards and on poisoning from meat and sausage.

The conditions which are necessary for the general extension and unification of the inspection of meat in public abattoirs, G. Barrier (*Compt. Rend. 10. Cong. Internat. Hyg. et Démogr., Paris, 1900, pp. 121–135*).—The author recommends compulsory inspection and slaughter in public abattoirs, the abandonment of private slaughterhouses, and thorough sanitary police measures in preventing the spread of disease through the agency of abattoir products.

Serum agglutination and its value in meat inspection, H. Miessner and Herbst (*Arch. Wiss. u. Prakt. Thierh., 28 (1902), No. 3–4, pp. 359–371*).—A critical review of the literature of this subject is presented. It was determined by Bordet that the serum of guinea pigs, after these animals had received from 5 to 6 intraperitoneal injections of rabbit blood, possessed the power of agglutinating and destroying the red blood corpuscles of rabbits. The experiments undertaken by the author were for the purpose of determining whether this discovery could be used to advantage in identifying meats in doubtful cases. An extensive series of experiments was conducted with this object in view. It was found that in serum reaction a valuable means was furnished for distinguishing between different kinds of meats. It is believed, therefore, that the identification of meat by means of the action of its specific serum constitutes a decided step in advance in the difficult problem of recognizing the kind of animal from which samples of meat were taken.

Results of strict sanitary regulations in Arizona, J. C. Norton (*Jour. Comp. Med. and Vet. Arch., 23 (1902), No. 10, pp. 613–619*).—The author presents a summary account of the sanitary regulations which have been put in force in Arizona for the purpose of controlling animal diseases. A rigid quarantine has been placed on districts where glanders appeared. The Texas fever infection was found in only one irrigated valley where lands were fenced. During the past 2 years the extent of sheep scab has been greatly reduced. Hog cholera does not appear to become established in the territory, but constant care is required to prevent the introduction of this disease, as well as swine plague. Turkey buzzards are said to have been instrumental in some cases in spreading swine plague from one locality to another. During the past season no cases of tuberculosis were noted in the territory, and only 2 horses were condemned on account of glanders.

Report of the State veterinarian of Washington for 1901 and 1902, S. B. Nelson (*Seattle: Metropolitan Press, Inc., 1902, pp. 16*).—It is stated that during the years covered by this report the services of the State veterinarian have been in greater demand than ever before. The veterinarian's attention was chiefly called to glanders, mange, tuberculosis, blackleg, actinomycosis, contagious keratitis, contagious abortion, and hog cholera. Fewer horses were found to be infected with glanders than during the previous year. Mange in horses is said to have assumed such serious proportions that legislation on the subject is recommended. A number of tuberculin tests were made and experiments were conducted for the purpose of devising a satisfactory treatment for contagious keratitis. In the treatment of this disease the author recommends an eyewash containing 1 gr. zinc sulphate and 3 gr. morphin sulphate; a few drops of this solution should be dropped into the eye night and morning. A copy of the law creating the office of State veterinarian in Washington is also given.

Thirteenth annual report of the veterinary service in Hungary, F. Hutyra (*Jahresber. Vet. Ungarn, 13 (1901), pp. 148, map 1*).—As in previous reports the author presents a general account of the status of government veterinary service in Hungary, together with notes on the prevalence of the more important animal diseases. The following diseases receive especial discussion: Anthrax, rabies, glanders, foot-and-mouth disease, pleuro-pneumonia, sheep pox, scabies, swine erysipelas, swine plague, hog cholera, buffalo plague, tuberculosis, lungworm disease, actinomycosis, etc.

Annual report of the civil veterinary department, Bengal, and of the Bengal Veterinary College, 1901–2 (*Calcutta: Bengal Secretariat Press, 1902, pp. 24*).—Notes are given on veterinarian dispensaries in various parts of Bengal, also on glanders, rinderpest, inspection of stock cars, and on the breeding of cattle, horses, ponies, and mules. A brief report is given of the work of the Bengal Veterinary College.

Report of the chief inspector of stock and brands, C. J. Valentine (*Min. Agr. South Australia Rpt. 1902, pp. 22–25*).—Brief notes are given on the prevalence of some of the more important diseases affecting sheep, cattle, horses, and hogs. These diseases include foot rot, pleuro-pneumonia, tuberculosis, actinomycosis, etc.

The toxic substances in normal sera, Carré and Valée (*Compt. Rend. Soc. Biol. Paris, 54 (1902), No. 6, pp. 176, 177*).—Experiments were conducted by the authors for the purpose of determining the toxic principles contained in the sera of cattle, sheep, goats, dogs, horses, and donkeys. The results obtained in these experiments lead the authors to conclude that the bactericide, globulicide, and toxic substances of sera are identical, or, in other words, that the same toxic substance exercises the action of destroying bacteria and the red blood corpuscles, and producing toxic effects.

The antiseptic value of Crede's colloidal silver preparation and its action in infection, E. Cohn (*Centbl. Bakt. u. Par., 1. Abt., 32 (1902), Nos. 10, Orig., pp. 732–752; 11, pp. 804–809*).—A critical review of the literature of this subject is given by the author. A large number of experiments were conducted for the purpose of determining its antiseptic value, in small laboratory animals, such as rabbits and guinea pigs. The silver preparation was administered either before or after infection with Staphylococci, Streptococci, anthrax bacilli, and cholera vibrios. During these experiments it was found that the soluble silver preparation, even in very large doses, had no effect either of a local or general nature upon the infectious processes. The pathogenic organisms were not destroyed or even checked in their growth by the silver preparation. In preliminary experiments it was found that the colloidal silver had no toxic effect upon healthy animals. It was also found that within 45 minutes after the colloidal silver was introduced into the blood it could no longer be demonstrated. It appears to be precipitated immediately after its introduction into the body, and the precipitate thus formed has no antibacterial action.

The bactericide power of fluorid of silver as compared with silver nitrate, carbolic acid, and corrosive sublimate, H. Kerez (*Centbl. Bakt. v. Par., 1. Abt., 32 (1902), No. 8–9, pp. 644–648*).—A series of experiments were undertaken for the purpose of comparing fluorid of silver as prepared by Professor Paterno, under the name Tachiol. Bacteria upon which these different antiseptics were allowed to act were tubercle bacillus, anthrax bacillus, typhoid bacillus, and anthrax spores. It was found that fluorid of silver possessed about the same bactericide power as silver nitrate. When used in a 1 per cent solution its antiseptic power was equal to a 5 per cent solution of carbolic acid. All of these substances, however, were found to possess a lower bactericide power than corrosive sublimate.

The decomposition of iodid of potash in the organism by means of nitrites, A. Stekanow (*Arch. Exper. Path. u. Pharmakol., 47 (1902), No. 5–6, pp. 411–416*).—The author made extensive analyses of different organs of rabbits and dogs and demonstrated the absence of nitrites in the gray brain substance, liver, stomach, spleen, brown substance of the kidneys, muscles, and blood. Nitrites were found in the white brain substance, lung tissue, bronchial glands, small intestines, medullary substance of the kidneys and lymphatic glands. The author believes from his observations that iodid of potash is for the most part decomposed in the presence and by the agency of nitrites.

The action of lecithin on the leucocytes, H. Stassano and F. Billon (*Compt. Rend. Soc. Biol. Paris, 54 (1902), No. 6, pp. 167–170*).—A large number of intravenous inoculations of emulsion of lecithin in rabbits produced as a constant result an increase in the number of leucocytes after each injection. When the lecithin was administered by intraperitoneal injection similar results were obtained, the leucocytes increasing in number to a considerable extent, especially around the point of inoculation. In the exudation produced by the lecithin the polynuclear leucocytes were surrounded and destroyed by the mononuclear cells.

The permeability of the placenta for micro-organisms, and its phagocytic power, N. K. Neëlow (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 14, Orig., pp. 691–693*).—The experiments reported in this article were made on pregnant rabbits and the objects of the experiments were to determine whether nonpathogenic micro-organisms were able to pass from the mother to the fetus through the placenta, and whether the placenta exercised any phagocytic action. As a result of these experiments it was found that nonpathogenic bacilli did not pass through the healthy placenta. The phagocytic power of the placenta was found to be very slight.

Investigations on a new pathogenic species of yeast, E. Cohn (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 15, Orig., pp. 739–748*).—Cultures were received from Klein of a species of yeast discovered by him to be pathogenic. The original material was found in milk. The morphological characters of the organism and its behavior in artificial cultures are described. The author conducted a number of inoculation experiments with this organism, on small and large experimental animals. White and gray mice were invariably killed by such inoculations, within from 4 to 11 days. Young white rats, however, proved to be immune. Symptoms of disease, but without fatal results, were produced in rabbits, while in guinea pigs more violent inflammatory lesions were produced as the result of inoculations. A pig 3 months old inoculated in the auricular vein exhibited a purulent conjunctivitis after 8 days, together with considerable disturbance of the general health. The animal finally recovered entirely from the symptoms. Similar inoculation experiments with a dog resulted also in the development of purulent conjunctivitis, from the discharges of which the organism was recovered. The dog died after 3 days. Experiments with pigeons showed that these birds were not susceptible. A number of feeding experiments were conducted with mice, and infection took place in all cases. These experiments, however, had to be abandoned, and the ultimate result of infection could not be observed.

A bacterium resembling that of bubonic plague, E. Klein (*Centbl. Bakt. u. Par. 1. Abt., 32 (1902), No. 10, pp. 673–675, figs. 3*).—*Bacterium bristolense* was isolated from rats found dead on a vessel from Asia Minor. Notes are given on the appearance and staining properties of this organism. Small intraperitoneal doses of the organism were found to have a fatal effect upon guinea pigs within 24 hours. Subcutaneous injections of cultures were fatal to the majority of experimental animals.

A bacillus liable to be mistaken morphologically for the bacillus of tetanus, F. F. Bushnell (*Amer. Vet. Rev., 26 (1902), No. 5, pp. 405–410*).—A bacillus was obtained from pus in a case of poll-evil, and cultures were made of the organism upon agar, gelatin, and other nutrient media. The bacillus is described in detail. It decolorizes when treated by Gram's method, and the spores resist a temperature of 80° C. for 45 minutes. The organism differs from the tetanus bacillus in that it is a facultative aerobe, is motile in young cultures, does not liquefy gelatin, does not take the Gram stain, is not pathogenic for guinea pigs.

Absorption of tetanus toxin, A. Marie and V. Morax (*Ann. Inst. Pasteur, 16 (1902), No. 11, pp. 818–831*).—The authors' experiments were made on mice, rabbits, and other laboratory animals. It was found that the absorption of the tetanus toxin by the peripheral nerves was the result of a specific affinity of this substance for the axis cylinder. This affinity is not manifested in experiments made in vitro, but is sufficiently apparent in living animals. The fixation of the tetanus toxin by the nerves takes place very rapidly. It is proposed in future experiments to study the rôle of different parts of the nervous system in absorbing tetanus toxin.

Observations on Bacillus coli communis from certain species of domesticated animals, V. A. Moore and F. R. Wright (*Amer. Vet. Rev., 26 (1902), No. 6, pp. 524–533*).—Notes are given on the appearance, biology, and pathogenic power of cultures of this bacillus obtained from horses, cattle, sheep, pigs, dogs, and chickens.

The variation in the pathogenic power of cultures from different species of animals was very marked.

The present aspect of the tuberculosis problem in the United States, S. A. Knopf (*Jour. Amer. Med. Assoc., 39* (*1902*), *Nos. 21, pp. 1309–1314; 22, pp. 1367–1373, figs. 16*).—Circular letters of inquiry were sent to various parts of the different States and Territories of this country for the purpose of learning the extent and nature of laws for the control of tuberculosis. The answers received to these inquiries are summarized by the author. From a study of this summary it is apparent that a great lack of interest prevails in many States and cities with regard to the danger of transmission of tuberculosis from animals to man or from one individual to another.

Recent investigations concerning the relation of human and bovine tuberculosis, D. E. Salmon (*Jour. Amer. Med. Assoc., 39* (*1902*), *No. 25, pp. 1571–1574*).—Notes are given on recent experiments and observations which indicate the inoculation of monkeys with bovine tubercle bacilli, and the transmission of tuberculosis from man to cattle and from cattle to man. Statistics are given concerning tuberculosis among children who drink cows' milk, and brief notes are presented on European and American customs with regard to sterilization of milk.

The intertransmissibility of human and bovine tuberculosis, R. R. Dinwiddie (*Jour. Amer. Med. Assoc., 39* (*1902*), *No. 25, pp. 1574–1577*).—The author discusses the anatomical lesions in cases of bovine tuberculosis and devotes special attention to an account of experiments which have been made to determine the comparative virulence of bovine tubercle bacilli for different species of animals. During the author's first experiments he was inclined to the belief that the bovine tubercle bacilli exercised a sort of selection among different animals, but later experiments indicate that this organism possesses an indiscriminate excess of virulence over the human tubercle bacillus.

Sanitary measures for the prevention of tuberculosis in New York City and their results, H. M. Biggs (*Jour. Amer. Med. Assoc., 39* (*1902*), *No. 26, pp. 1635–1640*).—The origin of tuberculosis in human patients and the means of transmission of this disease from man to man and from tuberculous animal products to man are discussed. Attention is called to the slow development of tuberculosis and the consequent difficulties in determining the source of infection. The author urges the desirability of exercising special precautions in preventing the transmission of this disease by whatever agency.

Transmission of bovine tuberculosis to man by accidental inoculation, and the experimental reinoculation of calves, Spronck and Hoefnagel (*Ann. Méd. Vét., 51* (*1902*), *No. 11, pp. 589–599*).—A detailed account is given of a case in which the authors believe that bovine tuberculosis was transmitted to man through a skin wound. The wound was on the finger and the apparent results of infection were seen in swelling of the arm and inflammation of some of the lymphatic glands. Material taken from the finger, which was amputated in treating the case, was used in inoculating guinea pigs, in which tuberculosis developed after the usual incubation period. The organism was then passed a second time through a guinea pig and virus obtained from the second guinea pig was used in inoculating a heifer, which rapidly developed signs of tuberculous infection.

Tubercular peritonitis in early life, T. M. Rotch (*Jour. Amer. Med. Assoc., 40* (*1903*), *No. 2, pp. 69–73*).—Notes are given on the clinical symptoms, diagnosis, and pathological anatomy of tubercular peritonitis in children, with regard to its relationship to bovine tuberculosis. The mesenteric lymph glands may often be affected as well as the alimentary tract, lungs, and other organs. The region of the infection in such cases is frequently doubtful.

Ohio combating tuberculosis, J. C. Burneson (*Amer. Vet. Rev., 26* (*1902*), *No. 4, pp. 328–333*).—Notes are given on the methods adopted in inspecting cattle in

Ohio and in the application of the tuberculin test. Attention is called to the desirability of reasonable, effective, and uniform legislation for controlling this disease.

Tuberculosis in the suprarenal glands in cattle, A. M. Bergman (*Arch. Wiss. u. Prakt. Thierh., 28 (1902), No. 5, pp. 496–504*).—In the author's opinion tuberculosis affects the suprarenal glands with considerable frequency. In all 21 cases were investigated, among which 1 gland was affected in 9 cases and both glands in the other 12. The suprarenal glands are also affected with tuberculosis in the case of hogs. The disease in this situation is of a chronic nature with pronounced tendency to the formation of calcareous deposits in the pathological foci.

Statistics on tuberculosis in hogs, N. Zelenin (*Arch. Vet. Nauk, St. Petersburg, 32 (1902), No. 8, pp. 693–727*).—Detailed statistical notes are given on the extent of tuberculosis in the various parts of Russia. Among 178,520 hogs examined during the years 1895–1899, tuberculosis was found in 5,679, or 3.2 per cent. As a result of further extensive compilation of statistics it was found that from 7.6 to 12.9 per cent of hogs were condemned on account of infection with tuberculosis.

Tuberculosis of the udder in a mare, C. Parascandolo and V. de Meis (*Arch. Wiss. u. Prakt. Thierh., 29 (1903), No. 1–2, pp. 198–208*).—The literature of mammary tuberculosis is briefly reviewed and detailed notes are given on a case of mammary tuberculosis in a mare. The case is considered to be rather important on account of the relative infrequency of the disease in horses.

Tuberculin, H. F. Palmer (*Jour. Comp. Med. and Vet. Arch., 23 (1902), No. 7, pp. 410–416*).—Notes are given on the nature of tuberculin, its reliability as a test for tuberculosis, and the method of making the test with it. A brief account is also presented of the nature, use, and effectiveness of mallein.

Actinomycosis of cattle, I. I. Shukevich (*Uchen. Zapiski Kazan. Vet. Inst., 19 (1902), Nos. 3, pp. 193–230; 4, pp. 231–335*).—In this article the author presents an exhaustive discussion of the symptoms of actinomycosis, the morphology of the actinomycotic tumors, the differential diagnosis between actinomycosis and pseudo-actinomycosis due to Streptothrix and also bacterial pseudo-actinomycosis. The biology of various forms of actinomyces is discussed in detail, with numerous references to the literature of the subject. Actinomyces is divided into 3 groups according to differences in morphology and biology. The pathological histology and pathogenesis of different forms of actinomycoses are also discussed in great detail.

Actinomycosis from a bacteriological standpoint, W. Silberschmidt (*Compt. Rend. 10. Cong. Internat. Hyg. et Démogr., Paris, 1900, pp. 90, 91*).—The author's conclusions from his study of this disease are as follows: Actinomycosis is not a simple disease of uniform etiology in all cases. The organisms isolated by Wolff, Israel, and Bostrœm are not always found in cases of the disease. The organisms of actinomycosis belong to the Streptothrix group and show many points of resemblance to the tubercle bacillus.

Experimental researches on the variability of Bacillus anthracis, H. Martel (*Recherches expérimentales sur la variabilité du Bacillus anthracis. Paris: C. Naud, 1902, pp. 85, pl. 1*).—An extensive series of experiments was conducted for the purpose of determining the influence of different conditions of environment upon the morphology and biology of the anthrax bacillus. As a result of these experiments it was found that anthrax bacillus exhibits a number of variations, either spontaneously or under the influence of artificial manipulation. The filamentous form of the organism, which is the normal form of the bacillus, when cultivated in a liquid nutrient medium may be changed into straight short rods when inoculated into dogs. Several passages through this animal results in a short bacillus capable of reproducing by fission and sporulation. This morphological variation of the organism is difficult to maintain. It is only necessary to pass the organism through very sensitive animals, such as young cats and guinea pigs, or to cultivate it on potatoes or agar-agar in order to obtain the original form. The functional variations of the anthrax bacillus are perhaps equally great. It is difficult to acclimate the organism to carnivora, especially to adult dogs. Anthrax bacillus from sheep is of medium virulence and is not pathogenic for adult dogs, even when inoculated in large doses. Some cultures of the bacillus from cattle are much more virulent than others. Successive passages of anthrax bacillus of weak virulence through rats, beginning with very young rats and ending with adult specimens, has the effect of greatly increasing the virulence. The vitality and virulence of anthrax bacillus are modified by antiseptics. These modifications vary according to the origin of the bacillus and the nature of the antiseptics. Cultures which have been maintained in a laboratory for a long time appear to be more susceptible than fresh cultures.

The influence of the tanning process upon anthrax spores, H. Kessler (*Inaug. Diss., Univ. Wurzburg, 1902, pp. 31*).—A study was made of the effect of the various chemicals and processes used in tanning leather upon anthrax spores which happen to be present upon the skin. As a result of these investigations it was found that chemicals and processes in common use can not be said to destroy all of the anthrax spores upon the skins. While a portion of the spores are induced to germinate during the softening process to which the skins are subjected, other spores are formed during the same process, so that future treatment must be calculated to destroy spores if the skins are to be rendered perfectly sterile. Solutions of caustic lime were found insufficient to destroy anthrax spores during the period of time occupied by the tanning process. In some experiments it was found that the spores withstood these solutions for periods of 12 to 17 days. The spores are easily destroyed by a 1 per cent solution of formalin if allowed to operate for a period of 48 hours.

An experiment in preventive vaccination for anthrax in the government of Yaroslav in May and June, 1902, A. V. Dedyulin (*Arch. Vet. Nauk., St. Petersburg, 32* (*1902*), *No. 10, pp. 862–881*).—In these experiments 2 vaccines were used and the animals upon which the experiments were made were horses and cattle. No death occurred among 125 horses and 579 cattle which were treated with a double vaccine.

The value of cooperation in the sanitary control of our periodic epizootics of anthrax, W. H. Dalrymple (*Jour. Comp. Med. and Vet. Arch., 23* (*1902*), *No. 8, pp. 484–498*).—Historical notes are given on the outbreaks of anthrax in former times and attention is called to the agency of birds, carnivorous animals, and insects in spreading contagion. Notes are also given on other means of spreading the disease, especially by carcasses of animals dead of anthrax, and by wool. The quarantine and sanitary measures which are indicated in an outbreak of anthrax are briefly discussed. The method of preventing anthrax by vaccination is discussed at some length.

Preventive vaccination for anthrax in the Novoladozh region in 1901, I. O. Gordzyalkovski (*Arch. Vet. Nauk, St. Petersburg, 32* (*1902*), *No. 8, pp. 653–663*).—A series of experiments was instituted for the purpose of determining the effectiveness of vaccination in preventing anthrax. As a result of the author's experiments it is concluded that when proper care is exercised in vaccinating animals, perfectly satisfactory results may be obtained from the vaccination of horses and cattle in northern regions. The second vaccination, administered in doses of 0.25 cc., renders the animals perfectly immune. Unsatisfactory results of vaccination experiments made in 1889 are explained as due to the use of too virulent cultures or improperly graduated doses.

Experimental researches on blackleg, E. Leclainche and H. Valée (*Ann. Inst. Pasteur, 16* (*1902*), *No. 12, pp. 931–939*).—In this article the authors report the results obtained from a continuation of their studies on blackleg. A number of different methods of vaccination were tried on cows and guinea pigs. Vaccination by a single inoculation of pure vaccine more or less attenuated is experimentally possible but is attended with serious accidents in practice. Double vaccination with pure vaccines, even when very attenuated, is not always safe. Inoculations with a mixture of immunizing serum and virus is attended with accidents and the immunization is uncertain. The method which is preferred by the authors consists in successive inoculations with an immunizing serum and a pure attenuated virus.

Vaccination for blackleg by means of the thread vaccine, H. GEORGE (*Bul. Agr. Algérie et Tunisie, 8 (1902), No. 22, pp. 548–550*).—A brief account is given of the use of the double vaccine method in the prevention of blackleg. As compared with this method, that in which vaccine is used on a thread is considered as possessing many advantages in simplicity, safety, and efficiency.

The preparation of blackleg vaccine, C. F. DAWSON (*Amer. Vet. Rev., 26 (1902), No. 8, pp. 764–767*).—Notes are given on the technique employed in the preparation of the virus and vaccine for prevention of the development of blackleg.

Bovine pasteurellon in the Malay Peninsula, CARRONGEAN (*Vet. Jour., 55 (1902), No. 330, pp. 321–327*).—The author makes a report on an investigation of a supposed outbreak of rinderpest in the Malay Peninsula. It was found that the disease was not rinderpest but hemorrhagic septicemia, or bovine pasteurellon. It appears in the Malay Peninsula in a subacute, acute, or chronic form. All forms are due to the same organism, an ovoid pasteurella. The organism varies greatly in virulence. Preliminary experiments give promise of good results with a method of preventive inoculation.

"Peste," C. NOCKOLDS (*Amer. Vet. Rev., 26 (1902), No. 5, pp. 411–415*).—"Peste" is said to be a native term for rinderpest. This disease is reported as having almost exterminated the domesticated animals in various parts of the Philippines. Notes are given on bacteriological studies of material obtained from investigating the disease.

Texas fever and its relation to the live-stock interests of Tennessee, W. C. RAYEN (*Jour. Comp. Med. and Vet. Arch., 23 (1902), No. 10, pp. 625–630*).—The irregular distribution of the cattle tick in Tennessee and the fact that this State lies on the boundary between the tick-free and infested portions of the country causes considerable complication in proper enforcement of sanitary measures with regard to Texas fever. It is stated that some portions of Tennessee lying south of the quarantine line are entirely free from ticks and that cattle may therefore be safely shipped from such localities to Northern States. The desirability of rational legislation based on careful examination of the territory concerned is advocated.

Some notes on redwater, J. HEWSON (*Vet. Jour., 55 (1902), No. 328, pp. 207–209*).—Brief notes are given on the appearance of this disease in certain localities. In 1 herd of 13, 10 were affected during the course of 3 weeks.

Rhodesian redwater, F. HUTCHINSON and P. D. SIMMONS (*Agr. Jour. and Min. Rec. [Natal], 5 (1902), No. 20, pp. 663–670*).—The authors present a summary account of observations made on trips of inspection through the country infested with this disease. Notes are given on the post-mortem appearance and clinical symptoms of the disease and on the practical methods which have thus far been found effective in controlling redwater.

The Rhodesia form of redwater, H. WATKINS-PITCHFORD (*Agr. Jour. and Min. Rec. [Natal], 5 (1902), No. 19, pp. 597–600*).—Brief notes are given on the peculiarly virulent form of redwater in Rhodesia and on the experiments which have already been conducted for devising means of controlling the disease.

Oil-water pumps for spraying cattle to destroy ticks, C. P. LOUNSBURY (*Agr. Jour. Cape Good Hope, 21 (1902), No. 5, pp. 427–434, pls. 2*).—The description is given of a number of different makes of pumps designed for producing a mechanical mixture of kerosene and water. Some difficulty is experienced with the use of all these pumps in obtaining a mixture of uniform strength. The question of the comparative value of dipping and spraying is briefly discussed. While in Australia dipping has proved more effective and convenient than spraying, the author believes that the spraying method may be retained in South Africa until dipping methods have been made more effective.

Articles and documents relating to the treatment of foot-and-mouth disease by intravenous injections of corrosive sublimate, according to the method of G. Baccelli (*Cura dell' afta epizootica con le iniezioni endovenose di sublimato corrosivo. Rome: G. Bertero & Co., 1902, pp. 290*).—In this volume a number of controversial articles relating to Baccelli's method of treating foot-and-mouth disease are brought together. The nature of the treatment and the present status of the controversy are outlined in an introduction by G. Loriga. The inaugural discourse of G. Baccelli, in which the method was first advocated, is also reproduced. The larger portion of the volume is occupied with reports from various parts of Italy, in which the method is stated to have given excellent results.

Prevention of foot-and-mouth disease, LOEFFLER (*Compt. Rend. 10. Cong. Internat. Hyg. et Démogr., Paris, 1900, pp. 194–197*).—On account of the infectious nature of this disease toward man strict measures should be taken for preventing the spread of the disease among human beings from outbreaks among cattle.

External ulcerative ano-vulvitis of cattle. A preliminary report, J. J. REPP (*Jour. Comp. Med. and Vet. Arch., 23 (1902), No. 9, pp. 546–562*).—The author observed a number of cases of this disease and gives an account of its symptoms and treatment, together with a discussion of previous reports on this subject. The disease may assume a mild or acute form. The observations thus far made indicate that the disease is not contagious. Swelling, reddening, and ulceration of the vulva and anus are observed, and in acute cases these ulcerations may assume a grave character and produce extensive sloughing of the tissues. The period of incubation is apparently about 1 week. As a rule the acute form of the disease does not appear in males. It was apparently confined to cattle. The disease may be easily differentiated from other similar diseases, such as eczema and vesicular exanthema of cattle. Detailed notes are given on those cases in which observations were made to determine the final history in each case. The economic importance of the disease is considerable on account of the fact that even after recovery heifers or cows are unfit for breeding purposes. A brief bibliography of the subject is appended to the article.

External ulcerative ano-vulvitis, S. T. MILLER (*Amer. Vet. Rev., 26 (1902), No. 4, pp. 326, 327*).—Attention is called to previous reports concerning the existence of this disease. The symptoms as described included a serous exudate, which rapidly produced a brown scab under which fetid pus was formed. The scabs spread rapidly, destroying the underlying tissue. The treatment used was a wash consisting of a strong solution of corrosive sublimate, after which an ointment was applied containing iodoform, oil of eucalyptus, carbolic acid, and petrolatum. This treatment effected a rapid and permanent cure.

Hemorrhagic septicemia, M. H. REYNOLDS (*Amer. Vet. Rev., 26 (1902), No. 9, pp. 819–837, figs. 6*).—The etiology and symptoms of this disease have been carefully investigated and it is believed that many cases of cerebro-spinal meningitis in the East as well as corn-stalk disease in the West should be referred to hemorrhagic septicemia. The symptoms are described in detail. As a rule the temperature is normal or subnormal; local lesions are very limited in extent or wanting; the blood appears to be normal; subcutaneous hemorrhages are common and vary greatly in size; they may appear in almost any part of the subcutaneous tissue, or may even involve the viscera. The disease appears suddenly, develops rapidly, and terminates fatally. During the 2 years in which the disease has been studied in Minnesota 52 outbreaks have occurred, resulting in the death of 551 cattle. Detailed notes are given on some of these outbreaks and descriptions are presented of the pathological anatomy. The source of infection is not yet well understood. Outbreaks have occurred under circumstances which rendered it impossible to trace the history of infection.

Some diseases incidental to pregnancy and parturition in the cow, A. M. CRICHTON (*Vet. Jour., 55 (1902), No. 325, pp. 17–26*).—Notes are given on a number of diseases associated with this function, including parturient eclampsia, parturient paresis, abortion, septicemia, metritis, etc.

A deviation from the orthodox method of treating parturient paresis and its etiology, W. E. A. WYMAN (*Jour. Comp. Med. and Vet. Arch., 23 (1902), No. 7, pp. 405, 406*).—The author discusses the hypotheses which have been formulated as explanation of the etiology of this disease and of the effectiveness of the treatment by means of infusions of iodid of potash. The author rejects the hypothesis of an autointoxication due to metabolic products in the udder as the cause of the disease, and believes that the true cause is to be found in an undue accumulation of nutritive elements in the body of the cow soon after parturition.

Parturient paralysis prior to parturition, J. J. REPP (*Amer. Vet. Rev., 26 (1902), No. 6, pp. 545–547*).—Notes are given on the symptoms and treatment of a case of this disease which was treated by the author. Sulphate of strychnin was administered, the milk was withdrawn, the udder disinfected, and Schmidt's treatment applied. The treatment, however, in this case was without avail and the case terminated fatally.

Success in the treatment of parturient paresis, W. N. BABCOCK (*Amer. Vet. Rev., 26 (1902), No. 7, pp. 635, 636*).—A case of this disease, which occurred before parturition, was treated by the author with success. Ergotin was administered every 2 hours and Schmidt's treatment was applied twice. The author states that as a rule he has from 8 to 10 cases of this disease per year, and has not lost a single case in which carbolic acid and glycerin have been added to the usual treatment.

On air treatment of milk fever, K. W. AAKERMAN (*Landtmannen, 13 (1902), No. 37, pp 594–597*).

Abortion in cows, W. S. PHILLIPS (*Amer. Vet. Rev., 26 (1902), No. 5, pp. 431, 432*).—An account is given of an outbreak of this disease among a Holstein dairy herd, together with brief notes on the symptoms of the disease in dogs.

Further experiments on the preventive treatment of contagious abortion (*Midland Agr. and Dairy Inst. [Kingston] Rpt. 1901, pp. 77, 78*).—Experiments are being carried out with 3 lines of treatment for contagious abortion. One consists in the internal administration of carbolic acid, the second in the use of antiseptics externally, and the third in a combination of the first and second methods. The sheds and other material which might carry the organism of abortion were carefully washed with lime, and in the first series of experiments pure carbolic acid was administered in doses of 1 fluid gm. for each cow twice a week. In the second series of experiments the posterior parts of the cow were sprayed twice a week with a solution containing 1 part izal in 80 parts of water. And in the third, these two lines of treatment were combined. The experiments have not as yet been carried on sufficiently to give definite results.

Barrenness of bovines, C. SCHMITT (*Amer. Vet. Rev., 26 (1902), No. 7, pp. 624–628*).—Notes are given on the various conditions which have been observed as causing sterility in cows. These include stenosis of the cervix, catarrh, and unnatural formation of the cervix.

Note on cirrhosis of the liver in horses and cattle, and its production in the latter experimentally, J. A. GILRUTH (*Veterinarian, 75 (1902), No. 896, pp. 436–441*).—A brief account is presented on the various theories which have prevailed regarding the cause of hepatic cirrhosis. It was shown by experiments that one form of cirrhosis of the liver may be produced as the result of eating *Senecio jacobæus*. It is believed that what is known as Winton disease and Pictou disease in Nova Scotia are due to the same cause.

Poisoning of cattle by common sorghum and Kafir corn, A. T. Peters and S. Avery (*Nebraska Sta. Bul. 77, pp. 16*).—Part of the work reported in this bulletin has already been referred to (E. S. R., 14, p. 298). A chemical study of sorghum and Kafir corn indicates that the prussic acid is not present as such but is set free from a glucosid by an enzym in the plant, or artificially by subjection to boiling water. Experiments made for the purpose of determining the effect of drying upon the presence of prussic acid gave evidence that the prussic acid is dissipated during the process of drying. Antidotes for poisoning by prussic acid mentioned by the authors include glucose, large quantities of milk, and plenty of fresh air. Further studies will be made to determine more definitely the conditions under which prussic acid is formed and also with regard to the effect of drying and the administration of antidotes.

Prussic acid in sorghum, H. B. Slade (*Jour. Amer. Chem. Soc., 25 (1903), No. 1, pp. 55–59*).—An outline of the chemical investigations on the poisonous principles of sorghum at the Nebraska Station. In 2 samples of sorghum 0.013 and 0.014 per cent of prussic acid was found. The author notes a great variation in the amount of prussic acid in different samples of sorghum and believes that the acid is produced in the plant by the action of a glucosid.

Phytolacca poison in cattle, G. R. White (*Jour. Comp. Med. and Vet. Arch., 23 (1902), No. 7, pp. 439–441*).—Five cattle out of a herd of 13 were badly affected with hemorrhagic enteritis accompanied with dysentery. An investigation of this outbreak of disease disclosed the fact that the cattle had eaten large quantities of phytolacca and the author believes that the trouble is to be ascribed to eating this plant.

Report on the mortality among cattle in the Northeastern District, W. T. Kendall (*Jour. Dept. Agr. Victoria, 1 (1902), No. 4, pp. 439–441*).—A serious outbreak of disease having appeared among cattle, an investigation of the subject was made by the author. It was found that the mortality was about 75 per cent, and that the disease occurred at all seasons of the year but chiefly during the summer months and in dry seasons. Notes are given on the chief symptoms and post-mortem findings. The animals exhibited suspended rumination, inability to swallow, arched back, rough coat, and decrease in the milk flow. It is believed that the disease is due to soil exhaustion. The animals do not obtain sufficient phosphates and other necessary materials from the poor vegetation on the impoverished soils. It is recommended in treating animals thus affected that bone meal, molasses, and linseed oil should be given in the rations, together with phosphate of lime, salts of iron, and potash.

Diseases of sheep, R. A. Craig and A. W. Bitting (*Indiana Sta. Bul. 94, pp. 88, figs. 17*).—This bulletin contains brief discussions of the common diseases to which sheep are susceptible and constitutes a sort of handbook of sheep diseases. The various diseases which are discussed are classified according to the organs affected or according to the nature of the parasitic organisms. The subjects discussed are as follows: Diseases of the digestive system, including sore mouth, depraved appetite, tympanites, white scours, jaundice, and peritonitis; diseases of the urinary organs; diseases of the respiratory organs, including catarrh, laryngitis, bronchitis, croupous pneumonia, pleurisy, etc.; diseases of the circulatory system; diseases of the nervous system, including encephalitis, cerebro-spinal meningitis, apoplexy, epilepsy, etc.; diseases of the reproductive system, including abortion, mammitis, etc.; diseases of the eye, and various other infectious or general diseases, such as foot rot, arthritis, malignant edema, rabies, sheep pox, blackleg, tuberculosis, tetanus, influenza, scab, and the diseases caused by lung and stomach worms, tapeworms, flukes, etc.

An experience with nodule disease of sheep, M. H. Reynolds (*Amer. Vet. Rev., 26 (1902), No. 5, pp. 416–419, fig. 1*).—An account is given of an extensive outbreak of this disease among sheep. The symptoms are described and notes are given on the means of preventing the spread of the disease. Treatment is usually of no avail, as the worms are too well protected on account of their situation in the walls of the intestines.

Anthracoid, septic, or blood poisoning diseases of sheep, W. G. Dowling (*Agr. Gaz. New South Wales, 13 (1902), No. 11, pp. 1098, 1099*).—The symptoms, treatment, and means of preventing malignant edema in sheep are briefly described. The author recommends the immediate treatment of skin wounds received during shearing, and for this purpose solutions of corrosive sublimate or permanganate of potash may be used.

Common colics of the horse, H. C. Reeks (*London: Ballière, Tindall & Cox, 1903, pp. XII + 224, figs. 8*).—In this volume the author has compiled and digested the available literature on the subject of colic in horses. To this is added material which the author has accumulated during his own practice. The following subjects are discussed: Definition and classification of colic, surgical anatomy of the abdomen, examination of patients, etiology of colic, gastric impaction, gastric tympany, rupture of the stomach, obstruction of the colon, obstruction of the small intestines, intestinal irrigation in obstructions of the colon, surgical treatment of intestinal obstructions, intestinal tympany, enteritis, superpurgation, and the treatment of colic in young animals.

Equine tropical diseases, particularly ulcerative lymphangitis, C. Nockolds (*Amer. Vet. Rev., 26 (1902), No. 8, pp. 756–763*).—Brief notes are given on a number of diseases commonly observed in the Philippine Islands. These include colic, pneumonia, founder, thrush, tetanus, glanders, anthrax, rinderpest, and ulcerative lymphangitis. Tetanus seems to be very prevalent at present in the Philippines. Special attention is given to ulcerative lymphangitis. This is described as a specific infectious disease characterized by lesions in the lymphatics and the formation of multiple abscesses in affected parts. The death rate is about 15 per cent. The hind limbs are most commonly affected. The animal becomes emaciated and the disease may run an acute or chronic course. It may be differentiated from glanders by the absence of ulcers and by various other symptoms which are described in detail. The bacteriology of the subject is not yet completed. Some success has been had in treating the disease with iodid of potash, iron, antiseptics, and actual cautery upon the ulcers. Hyposulphite of soda also promises good results.

Pneumonia in the horse: Its etiology, J. A. W. Dollar (*Veterinarian, 75 (1902), No. 896, pp. 395–409*).—The author presents a general account of this disease from a digest of the literature of the subject and from personal experience. The various forms under which the disease occurs are described, and notes are given on the bacteriology of the disease.

Pneumonia and its treatment, J. D. Fair (*Amer. Vet. Rev., 26 (1902), No. 5, pp. 425–430*).—Brief notes are given on the diagnosis, symptoms, and treatment of pneumonia in horses.

The pathogenesis of equine pneumonic emphysema, A. H. Baker (*Jour. Comp. Med. and Vet. Arch., 23 (1902), No. 9, pp. 562–565*).—The origin of this disease is believed to be found in 99 per cent of the cases in faulty dietetics. Gastric disturbances appear in nearly all cases. The author believes that the disease is produced by continued and excessive feeding with over-ripe hay, particularly timothy and red clover. As a means of preventing the disease the author recommends giving suitable grain ration in order to check the tendency of horses to eat too much hay.

Materials for a clinical diagnosis and pathological histology of acute nephritis in horses and dogs, M. P. Rukhlyadev (*Uchen. Zapiski Kazan. Vet. Inst., 19 (1902), Nos. 2, pp. 71–110; 3, pp. 133–152*).—A detailed discussion is given on the causes, symptoms, and treatment of this disease. Especial attention is directed to the clinical diagnosis and pathological histology presented during the course of the disease. The literature of the subject is critically discussed in connection with the investigations of the author.

Traumatic peritonitis, with symptoms of anthrax, A. S. Zhirnov (*Arch. Vet. Nauk, St. Petersburg, 32 (1902), No. 9, pp. 797–799*).—Brief notes are given on the course of this disease in horses in certain cases which presented symptoms similar to those of anthrax. Attention is called to the means of arriving at a satisfactory diagnosis in such cases.

Glanders, W. Hunting (*Veterinarian, 75 (1902), No. 896, pp. 409–436*).—The author presents a statistical account of the distribution of glanders and of the extent of losses due to this disease in Great Britain for a number of years. Notes are given on the relative prevalence of the disease in different months and on the methods by which it is spread. The author discusses also the cause, modes of infection, period of incubation, symptoms, diagnosis, post-mortem lesions, and the use of mallein in testing horses. The conclusions which the author draws from his study of glanders are as follows: Notification by the owner of glandered animals should be made either to the veterinary inspector or police authorities. Horses which have been exposed to contagion should be suspected and treated accordingly. Horses which have reacted to the mallein test should be quarantined. All animals which show clinical symptoms of glanders should be slaughtered. Compensation for slaughtered horses should be one-fourth their value. Compensation for horses slaughtered solely on account of reaction to mallein should be one-half their value.

Communicability of glanders and the action of mallein, A. C. Cope et al. (*Bd. Agr. [London], Rpt. Dept. Com. on Glanders, 1902, pp. 22*).—The experiments reported in this paper were undertaken to determine 2 points in connection with the study of glanders, viz, whether a healthy horse which reacts to mallein may spread the infection to other horses, and whether an apparently healthy horse which has once reacted and subsequently ceases to react is infectious. In experiments bearing on the first point 16 horses were used, and during this test it was found that healthy horses kept in association with reacting horses contracted glanders. It is concluded, therefore, that reacting animals, although without clinical symptoms, are capable of spreading the disease. Other experiments were conducted with horses which had ceased to react to glanders, and in these tests the results were negative in every case. It is concluded, therefore, that such animals are not capable of spreading the infection of glanders.

The persistence of the virulence of glanders bacilli upon artificial nutrient media, I. Shantuir (*Arch. Vet. Nauk, St. Petersburg, 32 (1902), No. 10, pp. 833–838*).—Experiments were made in keeping glanders bacilli in cultures upon potatoes, agar, glycerin-bouillon, and meat-peptone-glycerin-gelatin. Glanders bacilli cultivated on potatoes were found to have lost their virulence, as determined by inoculation experiments, after 4 months. The results of experiments with glanders bacilli on other nutrient media indicate that the organism may remain virulent for 5 months in the bouillon and for 5 to 7 months in the gelatin. Inoculations made with material kept for these periods killed guinea pigs within from 7 to 13 days. The author believes that these facts may not only be of theoretical importance, but may also have a bearing on veterinary sanitation, since the glanders bacillus may persist in a virulent condition for a considerable period outside of the animal body.

Inoculation of frogs with glanders, I. Shantuir (*Arch. Vet. Nauk, St. Petersburg, 32 (1902), No. 9, pp. 765–781*).—The literature of this subject is critically reviewed in connection with a discussion of the author's own investigations. It was found that the glanders bacillus retained its virulence for a period of at least 68 days within cold-blooded animals like the frog. The glanders bacillus was found in the blood of hogs within from 12 to 28 days after inoculation.

Differential diagnosis between bursattee, furunculus, and farcy, C. C. Lyford (*Amer. Vet. Rev., 26 (1902), No. 9, pp. 845–849*).—Bursattee appears to be an epithelial disease and makes its appearance on the surface of the body. It is a warm weather disease and prevails most extensively during wet seasons. Farcy usually affects the lymphatic system and may therefore be superficial or deep. The discharge from farcy abscesses is extremely cohesive. Furunculus usually appears below the fetlock and affects the coronary band. It is ushered in with a chill and the subsequent temperature varies from 105 to 107°. The most successful treatment for bursattee in the author's experiments was blistering with a mixture of cantharides and biniodid of mercury repeated every 2 or 3 days.

Epizootic abortion in mares, J. Guillerey (*Arch. Wiss. u. Prakt. Thierh., 29 (1903), No. 1-2, pp. 37-68, figs. 4*).—The literature of this subject is critically discussed in connection with a bibliography. The author made careful observations on a large number of cases and the usual symptoms are described, together with the more common complications. Special attention is given to the period of incubation, means of dissemination, etiology, and treatment. In preventing the persistence and spread of this disease it is considered absolutely necessary to employ the most rigid antiseptic treatment to all infected animals.

Nagana and mal de caderas as two distinct diseases, A. Laveran and F. Mesnil (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 20, pp. 838-840*).—According to the authors' opinions these 2 diseases are distinct, for the following reasons: There are constant morphological differences between *Trypanosoma brucei* and *T. equinum;* animals immunized against nagana are still susceptible to mal de caderas; and the serum of animals immunized against nagana is not active toward *T. equinum.*

Investigations on the treatment and prevention of nagana, A. Laveran and F. Mesnil (*Ann. Inst. Pasteur, 16 (1902), No. 11, pp. 785-817*).—A historical account of previous investigations on this subject is presented, in connection with a critical review of the literature relating to nagana. The chief objects of the authors' experiments were to test the problem of treating nagana with chemical products or with sera, including human serum and the serum of animals which had been rendered immune to nagana. The experiments also included attempts to immunize animals against the disease. A considerable number of chemical substances were experimented with for determining their value in the treatment of the disease. As a result of these experiments it was found that arsenious acid and human serum are the only substances which possess any great value in the treatment of nagana. Arsenious acid was found to prolong the life of affected animals. The animals treated with this chemical, however, did not always recover, and in some instances served as a source of infection for healthy animals. Human serum was found to produce a complete recovery in mice. The treatment of large animals, however, by this method is impractical on account of the large doses of serum which are required.

Statistics as to the color of surra victims, C. Nockolds (*Amer. Vet. Rev., 26 (1902), No. 9, pp. 850-854*).—Observations on the appearance of surra in the Philippine Islands indicate that mules are more susceptible to this disease than horses and that light colored animals are attacked more frequently than dark colored animals.

Notes on the tsetse fly and the surra disease in German East Africa, F. Stuhlmann (*Ber. Land u. Forstw. Deutsch-Ostafrika, 1 (1902), No. 2, pp. 137-153, pl. 1, figs. 4*).—The author gives an account of investigations which he made regarding surra in various parts of German East Africa. Especial attention is given to a detailed description of the tsetse fly in all its stages and brief notes are also presented on certain related species, such as *Stomoxys calcitrans.*

The occurrence of Glossina tabaniformis in Dar-es-Salaam, F. Stuhlmann (*Ber. Land u. Forstw. Deutsch-Ostafrika, 1 (1902), No. 2, pp. 173-175, fig. 1*).—The insect is described in detail and the measurements of its various anatomical structures are compared with those of the tsetse fly. The question is raised whether this species may also be instrumental in carrying surra. It appears from observations thus far made that this is not the case.

Notes on a feeding experiment to produce leucoencephalitis in a horse, with positive results, T. Butler (*Jour. Comp. Med. and Vet., 23 (1902), No. 8, pp. 498–501*).—An outbreak of this disease in an acute form occurred near Wakefield, Kans., in 1901. From an examination of the conditions surrounding this outbreak it appeared that the disease was due to the use of moldy corn. An experiment was made in feeding samples of this corn to 2 colts. One of the colts died after about 3 weeks, and a post-mortem examination showed that the white substance of the cerebrum was much softened and broken down. This condition corresponds to those found in spontaneous cases of the disease.

The duration of the presence of the plague organism when injected into the veins of the horse, Carougeau (*Ann. Inst. Pasteur, 16 (1902), No. 11, pp. 842–852*).—The author's experiments on this subject indicate that the cultivation of the organism of the plague at a high temperature or its passage through a horse may operate as a means of differentiating the more virulent forms of the bacillus. The less virulent bacilli are more easily destroyed by heat or by phagocytes in the horse than are the more virulent forms.

Cattle plague in camels, Chegis (*Arch. Vet. Nauk, St. Petersburg, 32 (1902), No. 10, pp. 882, 883*).—An investigation of this disease among camels showed that under certain conditions these animals may be seriously affected. The period of incubation was found to be 7 days. The disease begins with a fever and is characterized by continued high temperature, weakness, and erosions upon the mucous membranes of the mouth. The course of the disease is about 14 days and the death rate among camels appears to be about 5 per cent.

Canine distemper, F. T. G. Hobday (*Veterinarian, 75 (1902), No. 897, pp. 482–489*).—A number of experiments were conducted to test the value of vaccination in the prevention of distemper in dogs. It was found that 6 puppies after vaccination were quite as susceptible to distemper as other puppies which had not been vaccinated, and the distemper was as severe in the vaccinated as in the nonvaccinated animals. This method of treatment therefore appears to have little or no value.

Rabies and dog distemper, Beck (*Arch. Wiss. u. Prakt. Thierh., 28 (1902), No. 5, pp. 505–509*).—A careful study of a number of cases of rabies and dog distemper disclosed the fact that in doubtful cases a differential diagnosis may be reached by inoculation of rabbits; while both diseases may be communicated to rabbits, it is impossible to reproduce dog distemper by inoculation of other animals with the brain of affected rabbits. This point is considered to be of much importance in differentiating between the 2 diseases.

Fowl sickness, J. F. Marshall (*Agr. Jour. and Min. Rec. [Natal], 5 (1902), No. 18, pp. 565–567*).—Fowl sickness, or enteritis, is said to have broken out in many localities in Natal. Notes are given on the symptoms, post-mortem findings, and means of combating this disease.

Trichophytosis, J. B. Kessler (*Jour. Amer. Med. Assoc., 39 (1902), No. 17, pp. 1050, 1051*).—Attention is called to the prevalence of ringworm disease among various animals, especially in cattle, and the danger of transmission to man. A considerable proportion of the outbreaks of so-called barbers' itch is believed to be directly attributable to the prevalence of this disease in a mild form among calves.

Mange, S. B. Woollatt (*Agr. Jour. and Min. Rec. [Natal], 5 (1902), No. 17, pp. 533–537*).—The author discusses the various forms of mange, including sarcoptic, dermatodectic, and symbiotic. Notes are given on the animals affected with these different kinds of mange and on the results of the attack of the disease upon different animals. In the treatment of mange it is recommended that the scabs or crusts be removed by substances which readily dissolve such material, and that antiseptic dressings of various sorts be then applied to the infested areas. Among the various mange dressings discussed, mention may be made of the following: Kerosene emulsion dip, containing hard soap, water, and kerosene; lime and sulphur dip; tobacco and sulphur dip; and a dip containing ½ oz. arsenic, 1 lb. soft soap, 2 oz. washing soda, 4 oz. Stockholm tar, and 2 gals. water.

A note on various pasteurelloses observed in Turkey, M. Nicolle (*Ann. Inst. Pasteur, 16 (1902), No. 10, pp. 775–778*).—Brief notes are given on pneumonia of goats, fowl cholera, and the forms of pasteurelloses observed in rabbits, guinea pigs, horses, sheep, and dogs.

Animal parasites, A. A. Brown (*Jour. Dept. Agr. Victoria, 1 (1902), Nos. 4, pp. 409–412; 5, pp. 522–524, pl. 1; 6, pp. 613–615, pls. 5; 7, pp. 698–700, pl. 1*).—Notes are given on the life history and injuries due to infestation with *Tænia echinococcus*, *T. solium*, *T. expansa*, and tapeworms of the horse, cat, fowls, and man. The author discusses the alternation of generations in these worms, with special reference to the transmission of the immature form to the definite host. Suggestions are also made regarding the use of vermifuges for expelling the adult tapeworm from the intestines and also with regard to preventive measures to be adopted in checking the distribution of the species concerned.

AGRICULTURAL ENGINEERING.

Engineering for land drainage, C. G. Elliott (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd., 1903, pp. VII+232, pls. 6, figs. 41*).—This is "a manual for laying out and constructing drains for the improvement of agricultural lands," in which the purpose of the author has been "to emphasize and make clear those points which the student, the busy agriculturist, and the practical engineer should know. . . . It puts the experience and practice of years into a form which will be available to others who wish to quickly acquire the principles and practice of land drainage." Different chapters deal with soils, land drainage practice, leveling and topography, laying out drains in the field, fixing the grade of drains, maps and records, grading the ditches for tile, flow of water through pipes, size of lateral drains, open drains, drainage of barnyards, cattle lanes, etc., road drainage, drainage districts, estimates of cost, and benefits and profits of land drainage.

Irrigation institutions, E. Mead (*New York and London: The Macmillan Company, 1903, pp. XI+392, figs. 6*).—This work, by the Chief of Irrigation Investigations of this Office, "is based on 20 years' experience in the development of irrigated agriculture in the arid West" as engineer in charge of irrigation works, administrator of irrigation laws, and teacher and investigator of the subject of irrigation. It contains chapters on land laws of the arid region, the beginnings of irrigation, the doctrine of appropriation, contract water rights, measurement of water, the duty of water, irrigation in Colorado, California, Utah, Wyoming, and in the other arid and semi-arid States, riparian and interstate rights, and methods and measures needed for future development.

Hydrography (*Twenty-second Ann. Rpt. U. S. Geol. Survey, 1900–1901, pt. 4, pp. 690, pls. 65, figs. 244*).—This includes reports by F. H. Newell of progress of stream measurements in 1900 (see also E. S. R., 13, p. 1102); by A. P. Davis on the hydrography of the American isthmus; and by W. D. Johnson on the High Plains and their utilization. The last paper gives a summary of an earlier article on the same subject (E. S. R., 13, p. 1000) and discusses the underground supply of water and its utilization in irrigating the valleys, the uplands being utilized mainly for stock farming.

Water storage on Salt River, Arizona, A. P. Davis (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 73, pp. 54, pls. 25, figs. 4*).—This paper gives the results of surveys and investigations for water storage on Salt and Verde rivers during 1901. It is of especial interest as giving in considerable detail plans and specifications for the Salt River reservoir at the junction of Tonto Creek with Salt River, which is to be one of the first of the large projects undertaken under the recently enacted national water storage law. The paper also contains similar data for a reservoir at Camp McDowell on the Verde River, and detailed information regarding the water supply of the Salt and Verde River drainage basins.

Water resources of the State of Colorado, A. L. Fellows (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 74, pp. 151, pls. 14, figs. 5*).—This paper deals with drainage and stream measurements in the South Platte, Arkansas River, Rio Grande, San Juan, Grand River, and Green River irrigation divisions of Colorado, and gives a very complete compilation of hydrographic data for the State.

Report of progress of stream measurements for the calendar year 1901, F. H. Newell (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 75, pp. 246, pls. 13, figs. 71*).—This is the third part of the report on this subject, the first two parts being issued as Water Supply and Irrigation Papers Nos. 65 and 66 (E. S. R., 14, p. 615).

Observations on the flow of rivers in the vicinity of New York City, H. A. Pressey (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 76, pp. 108, pls. 13, figs. 8*).

Colonization and irrigation in Uganda and the British East Africa Protectorate (*Jour. Soc. Arts, 50 (1902), No. 2605, pp. 896, 897*).—This is an abstract of a paper read by R. B. Buckley at the recent meeting of the British associaton at Belfast, dealing with climatic conditions and possibilities of irrigation from surface and underground waters.

Irrigating pumping plant, A. W. Clapp (*Irrig. Age, 18 (1903), No. 5, pp. 134–136, figs. 4*).—Description of a pumping plant for lifting water from Utah Lake into Jordan River.

The limit of use of hand pumps, M. Ringelmann (*Jour. Agr. Prat., n. ser., 5 (1903), No. 8, p. 260*).—A 20-meter lift is considered the practical limit for such pumps.

On a leaf arrester or apparatus for removing leaves, etc., from a water supply, The Earl of Rosse (*Rpt. British Assoc. Adv. Sci. 1901, pp. 769, 770*).—"The apparatus consists of a cylinder of wire gauze, of 4 ft. diameter and 4½ ft. height, set in an opening in a vertical diaphragm extending across the supply drain and revolving twice in a minute or so round a vertical axis. The current flows through the gauze cylinder in a horizontal direction. The leaves, carried down with the current, attach themselves under pressure of the stream, are carried round till they reach the diaphragm, which on that side is double, with an intervening space of some 10 in., which is connected with the tail-race; and at this point, the current through the gauze being reversed, the leaves are detached and are carried by a portion of the water toward the tail-race. Four or five per cent of the supply is ample for conveying the leaves; probably much less would suffice. A very few leaves get past and onto the screen, but so few that they give no trouble." A disk form of the same apparatus is also described.

Investigations on agricultural machinery by the Bavarian Machine Testing Station of Weihenstephan, H. Puchner (*Untersuchungen auf dem Gebiete des landwirtschaftlichen Maschinenwesens ausgeführt von der königlichen bayerischen Maschinenprüfungsstation Weihenstephan. Munich: C. A. Seyfried & Co., 1903, pp. 215, figs. 96*).—This report gives a brief history of the organization and development of this station and summarizes the results of trials of various kinds of agricultural machinery conducted during the period from 1897–1902.

The Danish trials of agricultural machinery, E. Jörgensen (*De danske Redskabs og Maskinprörer. Copenhagen, 1902, pp. 199*).—The trials cover the period from 1872 to 1901. They were conducted under the auspices of the Royal Agricultural Society of Denmark by a permanent committee of the society, appointed to conduct the trials. Reports of the trials have been published in the agricultural press from time to time. A separate chapter is devoted to an account of trials of agricultural machinery in Sweden, Norway, and Germany.—F. W. WOLL.

The machine-testing station at Paris, M. RINGELMANN (*Ann. Inst. Nat. Agron., 2. ser., 1 (1876–1901), pp. 527–536, fig. 1*).—A brief account of the organization, development, equipment, and work of this station, which was established in 1888.

History of the development of the plow during 5,000 years, A. LAACKE (*Deut. Landw. Presse, 30 (1903), No. 17, pp. 135–138, figs. 21*).—A brief summary of the main steps in the development of the plow.

Practical experience in the use of grain-seeding machines, TRÜBENBACH (*Fühling's Landw. Ztg., 51 (1902) Nos. 19, pp. 718–723; 20, pp. 742–750*).

Exhibit of mowers and reapers at Hasselt in 1901, J. PYRO (*L'Ing. Agr. Gembloux, 13 (1902), No. 5, pp. 187–203*).—Some of the special features of the different machines are described and tests of draft are reported.

Historic highways of America, A. B. HULBERT (*Cleveland, Ohio: Arthur H. Clark Co., 1902, vols. 1, pp. 140, figs. 4; 2, pp. 152, pls. 3, maps 3; 1903, vol. 3, pp. 215, pls. 5, maps 2*).—This is the first three of the proposed series of ten volumes on this subject. Volume 1 deals with the paths of the mound-building Indians and great game animals; volume 2, Indian thoroughfares; and volume 3, Washington's road (Nemacolin's path), the first chapter of the old French war. The book describes these historic highways and discusses in a very interesting way their relation to national development.

Proceedings of the North Carolina Good Roads Convention, held at Raleigh, N. C., February 12 and 13, 1902, J. A. HOLMES (*U. S. Dept. Agr., Office of Public Road Inquiries Bul. 24, pp. 72, pls. 5*).—Among the subjects discussed are: Interest of Railroads in Road Improvement, by M. A. Hays; Progress of the Good Roads Movement in the United States, by M. Dodge; Practical Suggestions as to Ways and Means, by M. C. Butler; History of Road Making in Mecklenburg County, by S. B. Alexander; Good Roads and their Relation to the Farmer, by T. B. Parker; Economical Roads for Rural Districts, by W. C. Riddick; Good Roads and their Relation to Country Life, by W. R. Cox; Roads and Road Laws of Wake County, by W. C. McMackin; Good Roads and their Relation to Churches, by T. N. Ivey; The Good Roads Movement in the West, by J. W. Abbott; Economy of Good Roads, by G. T. Winston; Good Roads and their Relation to the Postal Service, by E. W. Pou; Rural Free Delivery of Mails, by A. W. Machen; Methods of Raising and Expending Road Funds, by F. M. Simmons; and Road Building in North Carolina, by J. A. Holmes.

Ninth annual report of the commissioner of public roads for the year ending October 31, 1902, H. I. BUDD (*Trenton, N. J.: The John L. Murphy Pub. Co., 1902, pp. 243, pls. 29, figs. 2, map 1*).—This report contains a detailed statement of cost, and descriptions of roads improved in 1902; and papers and compiled information regarding various phases of road building.

The protection of buildings from lightning, K. HEDGES (*Rpt. British Assoc. Adv. Sci., 1901, pp. 770, 771*).—The author compares continental and American methods, and describes the plans devised by him for the protection of St. Paul's Cathedral and Westminster Abbey as illustrating his views in general on this subject.

MISCELLANEOUS.

Fifteenth Annual Report of Alabama College Station, 1902 (*Alabama College Sta. Rpt. 1902, pp. 35*).—This includes the organization list of the station, a financial statement for the fiscal year ended June 30, 1902, and reports of the president and acting director, chemist, associate chemist, veterinarian, agriculturist, and biologist and horticulturist reviewing the different lines of station work during the year. Summaries of Bulletins 118–121 of the station are also included.

Biennial Report of Missouri Fruit Station, 1901-2 (*Missouri Fruit Sta. Rpt. 1901-2, pp. 39, pls. 4*).—The work of this station during the two years is outlined at some length and a detailed financial statement is given.

Annual Report of Nevada Station, 1902 (*Nevada Sta. Rpt. 1902, pp. 30, pls. 5*).—This includes a brief report of the board of control, a general review of station work during the year by the director, departmental reports, and a financial statement for the fiscal year ended June 30, 1902.

Thirteenth Annual Report of New Mexico Station, 1902 (*New Mexico Sta. Rpt. 1902, pp. 31*).—This includes the organization list of the station; a report of the director on the station staff, lines of investigation, publications, and exchanges; reports of the heads of departments; and a financial statement for the fiscal year ended June 30, 1902. A detailed outline of experiments is included in the report of the director and some of the results of the station work are briefly noted in the departmental reports.

The agricultural experiment station of Porto Rico; its establishment, location, and purpose, F. D. GARDNER (*Porto Rico Sta. Bul. 1, pp. 14, pls. 4*).—This contains an account of the establishment of the station under the auspices of this Office, a description of its location and equipment, an outline of contemplated work, and a statement as to the purpose of the station. This bulletin is published in both English and Spanish.

Annual Report of Virginia Station, 1902 (*Virginia Sta. Rpt. 1902, pp. 15*).—This contains the organization list of the station, a financial statement for the fiscal year ended June 30, 1902, and brief reports of the director and heads of departments.

Organization lists of the agricultural colleges and experiment stations in the United States (*U. S. Dept. Agr., Office of Experiment Stations Bul. 122, pp. 96*).

Experiment Station Work, XXI (*U. S. Dept. Agr., Farmers' Bul. 162, pp. 32, figs. 3*).—This number contains articles on the following subjects: The value of barnyard manure, nitrate of soda for market garden crops, cooking meat, feeding value of sugar-beet products, some recent experiments in horse feeding, poisoning of horses by the field horsetail, fattening beef for the market, difference in profit from dairy cows, effect of shearing on the gains made by lambs, soft pork and bacon, purifying milk by centrifugal separation, cheese prints, influence of the height of wheel on the draft of farm wagons, and the disk plow.

Reports of the farmers' institutes, live stock associations, and the dairy association of Manitoba for 1901 and 1902 (*Winnipeg, Manitoba: Dept. Agr. and Immigration, 1902, pp. 226*).

Annual agricultural statistics of France, 1901 (*Ann. Min. Agr.* [*France*], *21* (*1902*), *No. 3, pp. 494-788*).—Agricultural statistics of France for 1901, including crops, live stock, imports and exports, etc.

Austrian field crop statistics for 1902 (*Separate from Statist. Monatschr., Vienna, 1903, pp. 12, dgms. 5*).—The yields of wheat, rye, barley, oats, and corn for the different provinces are given in tables.

Norwegian agriculture during recent years, J. SMITT (*Aarsber. Offent. Foranstalt. Landbr. Fremme, 1901, pp. 1-75*).

Agriculture of the native Javanese, H. C. H. DE BIE (*Meded. 'S Lands Plantentuin, 1902, No. 58, pp. XXXIV + 107*).—This publication presents the agricultural conditions on the island of Java and describes the agricultural methods practiced by the natives. The culture of all important field and garden crops grown by the native Javanese is discussed.

Agricultural education in Cape Colony (*Agr. Jour. Cape Good Hope, 22* (*1903*), *No. 1, pp. 17-24, pls. 5*).—An account is given of the agricultural school at Elsenburg and of its work.

Accessions to the Department Library, 1902 (*U. S. Dept. Agr., Library Buls. 40, pp. 67; 43, pp. 37; 44, pp. 51; 45, pp. 72*).

NOTES.

California University and Station.—The university has received from the State legislature the following special appropriations: Two hundred and fifty thousand dollars for the erection of a new building on the campus, to conform to the Hearst-Benard plans for the new university; $12,000 for farmers' institute work for the next two years; $3,000 for viticultural investigations; and $5,000 for the establishment of a poultry experiment station at Petaluma. The poultry station is to be under the supervision of the director of the State station, and its objects, as set forth in the act of establishment, are "the study of the diseases of poultry, to ascertain the causes of such diseases and to recommend treatment for the prevention and cure of the same; to ascertain the relative value of poultry foods for the production of flesh, fat, eggs, and feathers; to recommend methods of sanitation; and to conduct investigations for the purpose of securing results conducive to the promotion of the poultry interests of the State." A fertilizer-control law has also been passed, providing $1,000 for laboratory equipment, and a revenue derived from license tax from which all expenses are to be paid. The station will have charge of the work.

Colorado College and Station.—The State legislature has made an appropriation of $40,000 for the construction of a building for the department of civil and irrigation engineering. The building will also contain the office of the director of the station.

Delaware College.—The legislature recently adjourned appropriated $15,000 for the college to cover the biennial period. Of this amount, $6,500 is to be used for repairs and additions to the buildings made some time since, about $6,500 for the erection of an addition to the workshop, and $2,000 for increasing the facilities for teaching agriculture.

Florida Station.—G. F. Mitchell, assistant in field experiments, has resigned to accept a position in South Carolina.

Idaho Station.—The State legislature has appropriated $3,000 for live stock and $2,000 for fences and repairs for the station.

Iowa College and Station.—Contracts have been let for the construction of a farm mechanics building, 60 by 100 feet and 1½ stories in height, at a cost of $35,000; a 2-story judging pavilion for agronomy and animal-husbandry work, at $12,000, and additional greenhouses for the departments of agronomy, soils, and horticulture, at $8,000. The courses of study have been revised and strengthened so as to include complete four-year courses in animal husbandry, agronomy, horticulture, and dairying.

Kansas College and Station.—The State legislature has made a total appropriation of $240,260 for the college for buildings and maintenance during the next two years. Of this amount $15,000 is for the erection and equipment of a creamery building. Provision is made for an addition to the shops at a cost of $5,000; $10,500 is appropriated for the purchase of additional land, and $10,000 for a water plant. The department of animal husbandry receives $5,000, the agricultural department (agronomy) $2,000, the horticultural department $1,500, and the farmers' institutes $2,000 a year for the biennial period in each case. The legislature also directed that a tuition fee of $3 per term, designated as an "incidental fee," be required of students residing within the State, and a matriculation fee of $10 and an "incidental fee" of $10 per annum of students from without the State. A total of $32,550 was appropriated for the substation at Fort Hays, making liberal provision for equipment and work. Among the items mentioned in the act are a dwelling house, horse barns, cattle sheds and yards, bridges, fences, a water plant, a skimming station, tools and implements, teams, and live-stock experiments. The appropriation for the substation also includes $1,000 for irrigation investigations in cooperation with this Department. The governing board of the college and station is at present constituted as follows: J. S. McDowell, of Smith Center, president; C. E. Friend, of Soldier, vice-president; E. T. Fairchild, of Ellsworth, treasurer; R. J. Brock, of Manhattan; J. W. Berry, of Jewell City; J. O. Tulloss, of Sedan; and E. R. Nichols, of Manhattan, secretary ex officio.

MASSACHUSETTS STATION.—Daniel L. Cleaves, assistant chemist, is no longer connected with the station.

MISSOURI FRUIT STATION.—Paul Evans, a graduate of the State University, has been elected director of the station.

NEBRASKA UNIVERSITY AND STATION.—The State legislature at its recent session appropriated $15,000 for the establishment and maintenance for two years of a substation in the western portion of the State. The work at first will be directed mainly to the protection and improvement of pasture lands. An appropriation of $100,000 was also made for buildings and improvements for the school of agriculture and experiment station, mainly for the purpose of facilitating agricultural instruction.

NEW HAMPSHIRE COLLEGE AND STATION.—C. M. Weed will have charge of nature study and elementary science courses at the session of the Marthas Vineyard Summer Institute, to be held at Cottage City, Mass., during the five weeks beginning July 14.

NEW JERSEY STATION.—The experiment station building was completely destroyed by fire on April 23. A large proportion of the records and collections was saved. The total loss was about $25,000, practically covered by insurance.

OHIO STATION.—A. D. Selby, botanist of the station, has been granted a research scholarship in the New York Botanical Garden, where he has been working since December.

TENNESSEE STATION.—The State assembly which has just adjourned appropriated $10,000 for the purchase of additional land for the station, and increased the appropriation for farmers' institutes to $5,000. The station will hereafter have charge of the fertilizer inspection work, which will probably add $3,000 to the income of the station.

UTAH STATION.—The State legislature recently adjourned made the following appropriations for the station for the two years 1903 and 1904: General maintenance, $750; printing, $2,000; building for poultry, $3,500; thrasher with power, $400; completion of cattle and sheep barns, $2,700; building for hogs, $1,500; pure-bred sheep and hogs, $800. An appropriation of $12,500 was also made for the establishment and maintenance for two years of five experiment farms to be located in different sections of the State for the purpose of testing the possibilities of the nonirrigable lands.

U. S. DEPARTMENT OF AGRICULTURE.—Dr. H. W. Wiley, chief of the Bureau of Chemistry, has been appointed official representative of the United States to the Fifth International Congress of Applied Chemistry, to be held in Berlin, May 31, 1903. W. H. Krug, formerly in charge of the dendro-chemical laboratory of the Bureau of Chemistry, has resigned to accept a position with A. Klipstein & Co., of New York.

H. L. Bolley, botanist of the North Dakota College and Station, has been appointed agricultural explorer of the Bureau of Plant Industry, the appointment to take effect June 1, 1903. He will visit different countries of Europe, particularly Russia, for the purpose of securing seeds of desirable varieties of flax. One of the principal objects will be to obtain varieties resistant to the flax wilt, due to a species of Fusarium, which disease has been under investigation by Professor Bolley for a number of years.

J. R. Stewart, laboratory assistant in the pathological division of the Bureau of Animal Industry, leaves May 1 to accept a position with the National Vaccine Company.

H. E. Williams has been promoted to assistant chief of the Weather Bureau, D. J. Carroll to chief clerk, and E. B. Calvert to chief of division, the appointments to take effect July 1.

G. K. Holmes, statistical expert of the Division of Statistics, has been made chief of the Division of Foreign Markets.

MISCELLANEOUS.—The North Carolina Agricultural and Mechanical College announces a summer school for teachers, to open July 1 and close July 31. Six courses of study are announced, as follows: (1) Elementary agriculture, (2) manual training, (3) nature study, (4) public school branches and kindergarten work, (5) literary subjects, and (6) Sunday-school instruction.

Andrew Carnegie has given $600,000 toward the endowment of the Tuskegee Normal and Industrial Institute.

The Agricultural Experimenters' League has recently been organized in New York "for the promotion of cooperative experiments in the various departments of farm husbandry; for the promotion of intercourse among those studying farm problems; for the advancement of agricultural education; for the collection and dissemination of data relating to country life, and for the purpose of supporting legislation favorable to the promotion of these objects." The active president of the league is James E. Rice, of Yorktown, N. Y., and the secretary, John Craig, of Cornell University.

A general index to the reports and bulletins of the Canada Experimental Farms published from 1887 to 1901 has recently been issued. The index is detailed and complete, and will be very useful in making readily accessible the results of the extended work which has been done on varieties of field crops, fruits, and vegetables, and along other lines.

Floral Life is the name of a new monthly magazine published in Philadelphia, and devoted to nature, horticulture, floriculture, and ornamental gardening. The magazine is in reality a continuation of *Meehan's Monthly*, which has been considerably enlarged and greatly improved in appearance by the use of many half-tone reproductions.

T. H. Schloesing, jr., has been elected a member of the Paris Academy of Sciences in the section of agriculture, in the place of the late P. P. Dehérain.

The death of Prof. Augusto Napoleone Berlese, which took place at Milan, January 26, 1903, is noted in *Staz. Sper. Agr. Ital., 36 (1903), No. 1, p. 33.* Professor Berlese was born in October, 1864, and received his doctor's degree from the faculty of science in 1885. His principal works, a list of which is given, have been conducted along the lines of vegetable pathology.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*

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Field Crops—J. I. Schulte.
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Horticulture—C. B. Smith.
With the cooperation of the scientific divisions of the Department.

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NOTE.—The publications of the United States Department of Agriculture, except those of the Weather Bureau, may be purchased from the Superintendent of Documents, Washington, D. C. For the publications of the Weather Bureau, requests and remittances should be directed to the Chief of the Bureau. The price of the Record is $1 per volume, or 10 cents per number. The prices of other technical publications are given in the list above. The publications of the State experiment stations are distributed from the stations and not from the Department.

EXPERIMENT STATION RECORD.

Vol. XIV. June, 1903. No. 10.

During the past few years there has been a rapid growth of interest in questions relating to courses in agriculture of secondary grade. This has been due to several causes operating at the same time. The faculties and equipment of the agricultural colleges have been very materially strengthened, the number and variety of their courses in agriculture have been greatly increased, and they are engaging much more largely in various forms of university-extension work through the farmers' institutes, correspondence courses, etc., thus attracting a larger number of students. But this development of the agricultural colleges has only served to bring out more clearly the fact that under the best conditions, if they are to maintain their standing as colleges, they can meet the educational requirements of only a small fraction of the youth on our farms. If any considerable body of the farm boys and girls are to receive definite instruction in the principles of agriculture, it must be in schools of lower grade than the colleges.

In the elementary schools no considerable amount of agricultural instruction can ever be included. Without doubt their courses of study can be much improved so as to inculcate a love of nature and country life and to impart many facts and a few principles which will be of direct and lasting benefit to the young people who will go out from them to spend their lives on farms, but in schools of this low grade it will never be possible to teach the sciences related to agriculture or to give any systematic instruction in the theory and practice of agriculture. For these reasons the friends of agricultural education are now turning their attention more and more to the problems relating to secondary courses in agriculture. The agencies for instruction of this grade are of several different kinds, as follows:

(1) High schools connected with agricultural colleges; (2) separate agricultural high schools endowed by the State; (3) agricultural schools for negroes in the Southern States; (4) private agricultural schools; (5) agricultural courses in normal schools; and (6) agricultural courses in public high schools.

1. The first agricultural high school to be established in connection with an agricultural college was the school of agriculture of the Uni-

versity of Minnesota, which has recently closed its fifteenth year of successful work. Its equipment and staff of instructors are in every way comparable with the best of our agricultural colleges, and its course of study, covering three years of six months each, includes: For the boys, music, English, mathematics, drawing, botany, chemistry, agricultural physics, agronomy, animal husbandry, dairying, horticulture, poultry culture, dressing and curing meats, forestry, veterinary science, carpentry, blacksmithing, and military drill; for the girls, the same subjects, except that courses in domestic science and practice are substituted for shop work and a portion of agriculture and gymnastics for military drill. For young men practical experience in field work at the university farm or elsewhere is required for graduation. The enrollment of the school is now nearly 500.

The school offers a practical course of study designed to fit young men and young women for successful farm life and it serves as a preparatory school for the college of agriculture. It is said that nearly all of its graduates not only return to the farm, but generally succeed. Many of the young men are growing up into leadership in their respective communities, and many more, by their quiet example, are bringing about a more hopeful view of the country and farming.

A school on essentially the same plan but without the courses in domestic science is maintained at the University of Nebraska. This school in 1902–3 had an enrollment of 207 boys.

2. Separate agricultural high schools, endowed by the State, are found in Wisconsin, Alabama, and California. In Wisconsin two such schools have been established in accordance with a State law of 1901 authorizing any county "to appropriate money for the organization, equipment, and maintenance of a school of agriculture and domestic economy," and providing that upon the approval of the State superintendent of public instruction the State will pay a share of "not to exceed one-half the amount actually expended for instruction in such school," in any county.

The Marathon County School of Agriculture and Domestic Economy, located at Wausau, Wis., was opened October 6, 1902. The buildings and equipment provided for this school cost $20,000. The school grounds cover 6 acres. The course of study for boys includes soils, plants, animal husbandry, rural architecture, blacksmithing, carpentry, and mechanical drawing; for girls, cooking, laundering, sewing, floriculture, and home management and decoration. Both courses include English language, literature, United States history, civil government, and commercial arithmetic, with farm accounts. Tuition is free to residents of Marathon County, and the enrollment the first of last December was 62.

The other school is located at Menomonie and is known as the Dunn County School of Agriculture and Domestic Science. This school is equipped with a fine brick main building, erected by the county at a cost of $16,000 for the joint use of this school and the county teachers' training school, and a frame building for shop work which, with the grounds surrounding the school, cost $5,000. The course of study covers two years and is very similar to that in the Marathon County school. Tuition is free to residents of Dunn County, and the enrollment in December last was 44.

In Alabama a State law passed in 1896 provided for the establishment of agricultural schools in each of the nine Congressional districts of the State, and appropriated to each of these schools $2,500 a year, which is supplemented by local funds. As actually established, these schools have been a combination of elementary and high schools, in which a general education has been given with a limited amount of instruction in agriculture. Farms are connected with the schools in which, in some cases, simple field experiments have been conducted. Over 2,000 boys and girls annually attend these schools, and several hundred of them receive some instruction in agriculture.

In California a State appropriation has been made for a polytechnic school to be located at San Luis Obispo, in which agricultural education of secondary grade will be a leading feature. Plans are being made for the opening of this school at an early day.

3. Courses in agriculture of approximately high-school grade are maintained at a number of schools for negroes in the Southern States. The Hampton Normal and Agricultural Institute in Virginia has a well-organized course of this character. A considerable number of students in the institute have previously attended the elementary school known as the Whittier School, which is a public county school located on the grounds of the institute and furnished by it with teachers. It is a practice school for the normal students in the institute and includes a kindergarten and five grades. All the boys and girls in this school, from the kindergarten up, have nature study, elementary studies in plant life, soils, and insects, and work in a garden attached to the school.

At the institute the regular course, which is given in a day school, covers the studies ordinarily taught from the sixth to the ninth grades, inclusive, and occupies three years. Pupils who have no funds may attend the night school to prepare themselves for the day school, meanwhile earning money by farm work during the day. Instruction in agriculture is given in both the day and night schools, and includes instruction in soils, plant protection, animal industry, dairying, drainage, and farm management. A supplementary course is offered to those intending to prepare themselves to be agricultural teachers or farm superintendents. The institute has an excellent equipment of laboratories and apparatus, farm implements, live stock, orchards, and arable land.

Agricultural courses on substantially the same plan are conducted at the Tuskegee Normal and Industrial Institute in Alabama. Among the other schools for negroes where successful agricultural courses are maintained are the Agricultural and Mechanical College for Negroes, Normal, Ala.; State College for Colored Students, Dover, Del.; Florida State Normal and Industrial College, Tallahassee, Fla.; Georgia State Industrial College, College, Ga.; State Normal School for Colored Persons, Frankfort, Ky.; Southern University and Agricultural and Mechanical College, New Orleans, La.; Alcorn Agricultural and Mechanical College, Westside, Miss.; Agricultural and Mechanical College for the Colored Race, Greensboro, N. C.; the Colored Normal, Industrial, and Mechanical College of South Carolina, Orangeburg; West Virginia Colored Institute, Institute, W. Va.

4. Within the past few years a number of private agricultural schools of secondary grade have been established. One of the most successful of these institutions is the National Farm School, at Doylestown, Pa. This school was established in 1896, and is supported by private donations, sales of farm products, and tuition fees. A State appropriation of $2,500 a year for two years became available in 1901, and the State legislature has recently increased the appropriation for the next biennial period. The equipment consists of a farm of 122 acres, main building, barn, greenhouses, and live stock. The course of study covers four years, and includes the English, mathematics, and natural sciences usually taught in a high school, together with a considerable amount of instruction in the science and practice of agriculture. About forty boys, mostly from cities, attend the school and perform a large part of the labor necessary to carry on the farm. Eight boys graduated in 1901, six of whom are employed on farms, and two have been assistants in the Bureau of Soils of this Department.

A similar school of slightly lower grade is the Baron de Hirsch Agricultural School, established in 1891 at Woodbine, N. J., and a secondary school, known as the Winona Agricultural and Technical Institute, has recently been established at Winona Lake, Ind., with a graduate of Purdue University in charge of the agricultural department.

5. In order to prepare teachers to give instruction in agriculture in the public schools of the State, short courses in agriculture and horticulture have been given at summer schools held in connection with the University of Missouri. These courses were, however, necessarily too limited in extent to fully meet the requirements of such work, and courses in agriculture have therefore been established in the three State normal schools, located at Kirksville, Warrensburg, and Cape Girardeau. At the first the course in agriculture occupies nine and one-half months; at the second, five months; at the third, ten months. The demand for normal instruction in agriculture has led the agricultural colleges of Connecticut and North Carolina to plan this year summer schools for teachers, in which agricultural subjects will be prominent.

6. All of these agencies combined can not fully supply the need for

secondary instruction in agriculture. It is believed, therefore, that the public high schools in or near the rural communities should offer courses of instruction in agriculture. These schools draw heavily upon the adjacent rural communities for their students and should modify their courses accordingly. In order to point out the feasibility of introducing agricultural courses into the high school programmes, the committee on methods of teaching agriculture of the Association of American Agricultural Colleges and Experiment Stations, in its report to the convention of the association held at Atlanta, Ga., in October, 1902, outlined a number of high-school courses in which agricultural topics were included. These were intended to show that such courses may be offered in the high schools without any violent or radical reorganization of existing programmes for such schools, the agricultural subjects, as a rule, taking the place of Latin or Greek in the smaller schools and being offered as electives in the schools where the elective system prevails.

At present the problem of obtaining properly qualified teachers for this work is a serious one. Most of the teachers now employed in the public high schools have been trained in literary and scientific institutions or in technical schools where no agriculture has been taught. It is only now and then that a teacher is found who is in real sympathy with agricultural education. Text-books on agricultural subjects, suitable for secondary schools, are also extremely scarce; but the trained teachers will appear and suitable text-books will be provided when the demand for these grows strong enough. What is especially needed now is an organized propaganda through the agricultural colleges, agricultural societies, boards of agriculture, farmers' institutes, the agricultural press, and other agencies, with a view to impressing on school officers and teachers and on the agricultural masses the importance and desirability of giving serious and active attention to this matter. Every successful effort to maintain an agricultural high school or an agricultural course in a public high school will add momentum to this movement. When the advantages to be derived from agricultural high schools and secondary courses in agriculture in public high schools are once clearly demonstrated in a few places, it will not be difficult to persuade the taxpayers generally to contribute the necessary funds for their maintenance.

Technical education has proved a sure road to commercial development and greatly increased wealth in connection with every industry which has received its benefits. It will prove equally so as regards agriculture. The tremendously productive results which have already come from the work of the agricultural colleges and experiment stations may be multiplied a hundredfold by introducing into the secondary schools definite and systematic teaching of the technique and scientific principles of agriculture.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Errors in manure sampling and analysis, W. FREAR (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 183–194*).—The general plan of sampling employed "involved the careful weighing of the entire mass of each manure, its immediate mixture, and reduction by partings, with repeated mixing between successive partings, until approximately aliquot portions of 50 to 75 lbs. each were obtained. Triplicate aliquots being taken, they were each finally subdivided, again mixed and parted, about one-fifth to one-seventh of each triplicate being reserved for analysis. Loss of weight during handling was checked by frequent reweighings.

"The weighings were made in a tared, metal-lined cask, having a capacity of 75 to 100 lbs. This cask was frequently retared during the weighings to correct for slight gains by small amounts of adherent matter, from which it was, however, kept as free as possible by frequent cleaning. The average tare was judged to be correctly represented by the average of the frequent tare weighings made. The scales employed weighed to 7 gm."

The analytical determinations, generally in triplicate, included: "(1) Nitrogen, by the König method: Two hundred grams manure dissolved to a paste in 650 to 1,150 gm. of concentrated sulphuric acid, 10 to 20 gm. of the paste taken for determination by the ordinary Kjeldahl method; (2) nitrogen in air-dry substance: Immediately after air drying, later, as a check upon change in hygroscopic moisture; (3) water-soluble nitrogen: One gram, washed on filter with 200 cc. of water, nitrogen determined in insoluble residue; . . . (4) ammoniacal nitrogen: One gram distilled with 250 cc. of water and 5 gm. of suspended magnesia under 22 to 25 in. vacuum for 30 to 45 minutes; . . . (5) hygroscopic moisture: Two grams in water-oven to constant weight; (6) ash: Residue from 5 ignited at low red heat; (7) potash: In 10 gm. after carbonizing with sulphuric acid, by Lindo-Gladding method; (8) water-soluble potash: In solution made from 10 gm., by boiling, Lindo-Gladding method; (9) phosphoric acid: Five grams fused with sodium carbonate and potassium nitrate, fusion analyzed by molybdate-magnesia mixture method; (10) *matiere noire*: Ten grams treated as usual with weak hydrochloric acid followed, after washing, with 4 per cent ammonia water; (11) potash and phosphoric acid, associated with *matiere noire:* In residues by Lindo-Gladding and fusion methods."

The studies were made on 2 lots of manure. The losses of weight at the second weighing were found to be 3.08 and 3.36 per cent, respectively; at the third weighing 4.6 and 7.98 per cent. "The large percentages of loss occurring during the thorough mixing of the material declare strongly the need for expedition and care at every other point to protect the manure from heat, wind, and large surface exposure whereby volatilization might be increased; they further emphasize the need for reweighing, at every parting, of the entire mass parted."

There were ranges of 1.25 and 4 per cent in the determinations of moisture in duplicate samples. The variations in the determinations of other constituents are shown in the following table:

Variations in triplicate determinations of various constituents in two samples of manure.

Constituents.	Sample I.			Sample II.		
	(a)	(b)	(c)	(a)	(b)	(c)
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Ash	11.39	11.19	11.43	14.47	16.11	16.27
Nitrogen	2.40	2.29	2.23	2.22	2.19	2.33
Potash	3.22	3.28	3.25	3.55	3.46	3.60
Phosphoric acid	1.33	1.29	1.29	1.36	1.41	1.95

"We may conclude from the foregoing facts that a large mass of manure can be satisfactorily represented only by original samples of relatively large amount; that the latter must be thoroughly subdivided under conditions unfavorable to heating, and, so far as can be, to evaporation; that check weighings be made at every parting, and that, when the material is sufficiently mixed, triplicate subsamples should be taken for separate determination of loss in air-drying, at least, in order to guard against errors introduced by large inequalities in the moistness of samples. Furthermore, it is clear that in handling large masses of manure greater accuracy of final result will be secured by rapid weighing in large quantities on scales of low sensitiveness than by weighing in small quantities on more sensitive scales, because of the rapid drying which the manure undergoes under the latter conditions."

The estimation of available phosphoric acid in manures, W. F. Sutherst (*Analyst, 28 (1903), No. 324, pp. 66–71*).—Comparative determinations of the solubility of the phosphoric acid of basic slag, basic superphosphate, precipitated phosphate, and coprolite in 1 per cent citric acid and in solutions of potassium binoxalate, bitartrate and bimalate of the same degree of acidity as the citric-acid solution are reported. The potassium-binoxalate and bitartrate solutions gave results on basic slag agreeing quite closely with those obtained with 1 per cent citric acid. The potassium-bimalate solution gave much lower results than the other solvents used. With the other phosphatic materials tested the solvents gave very discordant results. From the results of repeated extractions of basic slag and coprolite with 1 per cent citric-acid solution the conclusion is drawn "that practically the whole of the phosphoric acid in any manure is available for plant food, but that in some it is assimilable in a shorter time than others. Whether the usual method of testing the available plant food and the results obtained by it give any definite idea of the amount a plant is capable of absorbing or not, it seems from the experiments carried out that there is certainly a relation between the amount dissolved and the amount which is in an easily assimilable form, since the large proportion of phosphoric acid dissolved out of the basic slag by one treatment with citric acid as distinguished from that removed from coprolite in proportion to the total present easily accounts for the more rapid effect of basic slag on a crop than that of a ground mineral phosphate." The question as to what extent the action of the weak acid solvents used in determining the availability of phosphoric acid imitates natural processes due to acid excretions from the roots of plants is discussed at some length by the author and others, and the arbitrary character of such methods of determining availability of phosphoric acid was pointed out.

On the solution of insoluble calcium phosphate by means of ammonium citrate solutions, K. Zulkowski and F. Cedivoda (*Chem. Ind., 26 (1903), pp. 1–9, 27–33; abs. in Chem. Centbl., 1903, I, No. 8, pp. 477, 478*).—Investigations are reported which lead to the conclusion that solution of calcium phosphate in ammonium citrate solutions depends upon the formation of neutral and acid calcium-ammonium citrates, of which the latter only are stable. The results of a study of the behavior of mono-, di-, and tri-ammonium citrates toward di-, tri-, and tetra-calcium phosphates are reported in detail.

On the determination of citric-acid soluble phosphoric acid, W. Naumann (*Chem. Ztg., 27 (1903), No. 12, pp. 120, 121*).—The method proposed is as follows: Add ½ liter of 2 per cent citric acid to 5 gm. of slag and shake in a rotary apparatus for ½ hour. To 100 cc. of the filtered extract thus obtained add 8 cc. of strong nitric acid and heat first over a small flame and then boil until the volume is reduced to about 25 cc. Cool, add 25 cc. of strong sulphuric acid and 5 cc. of nitric acid, and heat until white fumes begin to come off (about 10 minutes), cool in the bath, and make up to a volume of ¼ liter. To 125 cc. of the filtered solution thus obtained add 35 cc. of concentrated ammonia, 50 cc. of 24 per cent ammonium citrate, and 25 cc. of magnesia mixture, and shake for ½ hour to precipitate phosphoric acid.

The preparation of ammonium nitrate molybdic solution for the determination of phosphoric acid, A. Mercier (*Bul. Acad. Roy. Belg., 16 (1902), pp. 389–393; abs. in Chem. Centbl., 1903, I, No. 6, p. 359*).—Various methods of preparing molybdic solution were compared. That preferred by the author is as follows: Dissolve 100 gm. of molybdic acid in 144 cc. of 10 per cent ammonia (sp. gr. 0.9593), make the volume to 500 cc. with water, and pour into 1 liter of nitric acid of 1.2 sp. gr.

The rapid determination of potash in kainit, M. Passon (*Ztschr. Angew. Chem., 15 (1902), No. 49, pp. 1263–1265*).—The method proposed is briefly as follows: Dissolve 10 gm. of the salt in 200 cc. of water acidified with 5 cc. of hydrochloric acid, boil, and add barium chlorid in excess to precipitate the sulphuric acid. Cool, make up to 500 cc. with alcohol, cool again, make up again to the mark, and filter. To 25 cc. of the filtrate add platinum chlorid solution and 125 cc. of 96 per cent alcohol, and stir for 5 minutes. Filter through a Gooch filter, wash with 80 per cent alcohol, then with ether, dry for 2 hours at 100° C., and weigh. Dissolve the precipitate with hot water, wash, and dry as before, and weigh again. The difference gives the potassium platinochlorid corresponding to 0.5 gm. of substance.

The determination of potash in fertilizers by substituting milk of lime for ammonia and ammonium oxalate as the precipitant, C. L. Hare (*Jour. Amer. Chem. Soc., 25 (1903), No. 4, pp. 416–420*).—Previously noted (E. S. R., 14, p. 109).

Modifications of an apparatus for the determination of nitrates and nitrites, E. Commanducci (*Staz. Sper. Agr. Ital., 35 (1902), No. 9, pp. 747–752, fig. 1; abs. in Chem. Centbl., 1903, I, No. 3, p. 194*).

The volumetric determination of nitric acid, J. K. Phelps (*Ztschr. Anorgan. Chem., 33 (1902), p. 357; abs. in Chem. Ztg., 27 (1903), No. 15, Repert., p. 35*).—Tests of the accuracy of a modification of Holland's method[a] are reported. With proper precautions, which are described, the method is said to give accurate results.

A simple method for the quantitative determination of nitric acid in water, G. Frerichs (*Arch. Pharm., 241 (1903), No. 1, pp. 47–53*).—The method proposed rests upon the fact that the nitrates are readily converted into chlorids by the addition of hydrochloric acid and the excess of the acid may be removed by evaporation. Thus by determining chlorin in the original solution; adding hydrochloric acid, evaporating to dryness, and determining the chlorin in the residue; subtracting the results of the first determination from the second and multiplying the remainder by 1.525 the N_2O_5 present in the water may be obtained.

The determination of hardness in water, W. Peters (*Apoth. Ztg., 18 (1903), pp. 25, 26; abs. in Chem. Centbl., 1903, I, No. 7, p. 418*).—For waters containing large amounts of magnesia in addition to lime the author uses Wartha's method.

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[a] Chem. News, 17 (1868), p. 219.

Analysis of milk and dairy products (*Nord. Mejeri Tidn., 18 (1903), No. 11, p. 142*).—Official methods of analysis adopted by the Agricultural Department of Sweden for the State and County Chemical Control Station.—F. W. WOLL.

The determination of the percentage of water in butter (*Jour. Dept. Agr. and Tech. Instr. Ireland, 3 (1902), No. 1, pp. 82–92*).—This discusses different methods of sampling and analysis and gives the results of comparative tests. The most satisfactory method of sampling was the use of a large trier thrust vertically through the bulk of the butter, the core so obtained being placed in a glass-stoppered bottle, melted, shaken, and afterwards cooled. Of the ordinary analytical methods for determining moisture the use of a flat-bottomed porcelain dish and pumice stone is considered the most accurate, the details of manipulation as recommended for creamery and factory managers being given.

The application of Wollny's refractometer to the determination of the fat content of skim milk, C. BARTHEL (*Nord. Mejeri Tidn., 18 (1903), No. 6, p. 71*).—Comparisons of determinations of the fat content of 134 samples of separator skim milk by the refractometer and Gottlieb's methods led to the conclusion that the former method is well adapted for use where a large number of determinations are to be made. The average difference of the determinations by the two methods was 0.01 per cent, a difference of 0.05 per cent occurring in 2 cases, 0.04 per cent in 5 cases, and 0.03 per cent in 17 cases. Thirty-eight comparative determinations were alike.—F. W. WOLL.

Methods of incineration for determining chlorin in animal solutions and organs as well as in foods, C. STRZYZOWSKI (*Oesterr. Chem. Ztg., 6 (1903), pp. 25–28; abs. in Chem. Centbl., 1903, I, No. 10, p. 601*).—In the method proposed the substance is dried and carefully incinerated in presence of magnesium oxid (1 gm. to 20 cc. of solution or 10 gm. of the solid substance moistened with 10 to 15 cc. of water). The product thus obtained is dissolved in the exact amount of sulphuric acid required for complete solution and the chlorin is determined by titration according to the Mohr method.

The chemistry of plant and animal life, H. SNYDER (*Easton, Pa.: Chemical Pub. Co. Press, 1903, pp. XVII + 406, figs. 102*).—This volume, which is designed as a text-book suitable for the instruction in chemistry of students in agricultural colleges, contains chapters on the foundation principles of chemistry, the chemistry of plant growth, the composition of plants, feeding value of different crops, rational feeding of animals, and related topics. In every case the explanations are full and clear, and the volume should prove a useful handbook, especially since the subjects presented and the methods of treatment are such that the relations of chemistry to everyday life are emphasized.

Text-book of agricultural chemistry, A. MAYER (*Lehrbuch der Agrikulturchemie. Heidelberg: Carl Winter, 1902, 5. rev. ed., vol. 2, pt. 2, pp. VI+253, figs. 3*).—This is the second and concluding part of the second volume of the fifth revised edition of this work (E. S. R., 13, p. 913). The first part of this second volume deals with soils; the second part is devoted to fertilizers. The third and last volume of this work, which is now in course of preparation, deals with the chemistry of fermentation.

The application of the equilibrium law to the separation of crystals from complex solutions and to the formation of oceanic salt deposits, E. F. ARMSTRONG (*Rpt. British Assoc. Adv. Sci. 1901, pp. 262–282, figs. 5*).—This is a paper compiled from a series of 23 papers by van't Hoff and his pupils (E. S. R., 14, p. 430), published since the year 1897 in the proceedings of the Berlin Academy of Sciences. The author states that "apart from these and the information given by van't Hoff in his text-books, there are only two other papers bearing on the subject—one by van der Heide,[a] the other by Löwenherz."[b]

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[a] Ztschr. Physikal. Chem., 12 (1893), p. 416.

[b] Ztschr. Physikal. Chem., 13 (1894), p. 459.

Methods for the investigation of canceling inks and other stamping inks, E. E. Ewell (*U. S. Dept. Agr., Bureau of Chemistry Circ. 12, pp. 8*).

New laboratory apparatus, C. Zahn (*Chem. Ztg., 27 (1903), No. 7, pp. 69, 70, figs. 3*).—Descriptions are given of burettes with automatic arrangements for filling to the zero point, and of a pipette for use in Gerber's milk test.

Report of the Swedish chemical control stations for 1900, A. Lyttkens (*Ber. K. Lantbr. Styr., 1900, pp. 335–357*).—The 10 chemical control stations supported by the Swedish Government examined 54,691 samples of agricultural products during the year, of which number over 46,000 were dairy products. The 8 chemical stations supported by county agricultural societies examined 3,687 samples, of which number nearly two-thirds were dairy products. Summaries of the results of analyses of soils, fertilizers, feeding stuffs, dairy products, etc., for all stations are presented in the report.—F. W. WOLL.

BOTANY.

North American species of Leptochloa, A. S. Hitchcock (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 33, pp. 24, pls. 6, figs. 16*).—In order to clear up some of the bibliographical and taxonomic difficulties in this genus the author has reviewed the North American species, giving a key and diagnostic description to those species occurring within the range indicated. With one or two exceptions most of these species are confined to the warmer parts of the country and one species (*Leptochloa dubia*) is an important range grass in the Southwest.

Notes on the poisonous plants of Nebraska, C. E. Bessey (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 34–41*).—A general summary is given of a more extensive paper in which 12 species of plants reputed poisonous to man externally, 29 internally, and 35 species poisonous to stock are described. In the summary only those are enumerated and described which are rather definitely known to be injurious.

Notes on fungi, C. G. Lloyd (*Mycological Notes, 1903, No. 13, pp. 121–132, pls. 4, figs. 2*).—Keys are given, together with technical descriptions of the species of Catastoma and Mitremyces. Miscellaneous notes are also given of *Geaster fornicatus, Dictybole texensis, Torrendia pulchella*, etc.

Note on the water content of certain plants, W. R. Lazenby (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 195–200*).—A report is given of a series of observations made upon the water content of a number of plants on account of the bearing of this factor on the effect of drought and frost on the plants. The accompanying table shows the percentage of water in the foliage and twigs of a number of varieties of fruits:

Percentage of water in foliage and twigs.

Variety.	Foliage.		Twigs.	
	September 21.	October 7.	March 23.	April 2.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Delaware grape	57.80	48.35	39.89	....
Concord grape	53.78	49.84	42.00	....
Ostheim cherry	50.04	41.63	47.15	49.66
Ida cherry	51.40	48.64	53.11	51.59
Snyder blackberry	45.50	45.71	46.86	49.01
Wilson, Jr., blackberry	42.51	41.17	49.57	46.66
Duchesse pear	45.78	44.47	49.55	51.82
Keiffer pear	48.60	45.70	51.44	51.35

The percentage of moisture in a number of forest trees was also determined at different periods, the average percentage being shown in the accompanying table:

Average percentage of moisture in forest trees.

Kind.	December 1, 1898.	March 2, 1899.	April 15, 1899.	May 24, 1899.	Average.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Poplar	52.3	52.6	54.6	56.4	53.9
Maple	56.5	45.4	43.4	52.3	49.4
Walnut	52.7	41.9	45.5	56.5	49.1
Cucumber	42.4	57.8	49.4	60.1	52.4
Ash	37.2	45.6	40.1	55.1	44.5
Oak	41.8	41.2	40.2	53.6	44.2
Elm	43.9	41.7	51.9	56.3	48.4
Total average	46.6	46.4	46.1	55.7	48.8

The influence of humidity on the formation and development of stomata, G. Mariana (*Separate from Atti Inst. Bot. Univ. Pavia, 2. ser., 8 (1902), pp. 32*).—Studies are reported on the effect of humidity on the development of stomata on the cotyledonary leaves of a number of plants such as buckwheat, beets, radishes, balsam, white lupine, crimson clover, plane tree (*Acer pseudoplatanus*), gourds, etc. According to the author, humidity favors the development of the superficial area of the cotyledons, and for a given area there are usually fewer stomata per unit of surface of those cotyledons produced in moist atmospheres. The development of the epidermal cells in the cotyledonary leaves follows the same rule. In general a humid atmosphere favors the formation of stomata, although not increasing their number. Humidity and drought were found to have no effect in influencing the relative number of stomata on the two surfaces of the leaves.

The effect of concentration of solutions on the respiration of plants, W. Palladine and A. Komleff (*Rev. Gén. Bot., 14 (1902), No. 168, pp. 497-516*).—The effect of different concentrations of saccharose on the respiration of a number of different plants is reported. The results obtained show, so far as the respiratory energy of the plants was concerned, that the respiration of the plant was highest when solutions of average concentration were used. If stronger or weaker solutions were employed there was a marked falling off in the respiration of the plants. The effect of sudden changes in the strength of solution showed that changing etiolated leaves of beans from a strong to a weak solution resulted in a rapidly increased respiration, while transferring them from a weak to a stronger one diminished the respiratory energy.

The influence of mineral salts on the respiration of plants during germination, S. Krzesnieniewski (*Separate from Bul. Acad. Sci. Cracovie, 1902, pp. 1-41, pls. 2; abs. in Bot. Centbl., 90 (1902), No. 19, pp. 525, 526*).—After reviewing the investigations of others relating to the action of certain minerals on germination the author gives a report of his investigations on the influence of the various mineral salts contained in the Knopp solution on the germination of radish seed. It was found that the respiration of plants began at the time the seed began to swell and increased quite rapidly as soon as the radicle began to appear. The proportion of carbon dioxid to oxygen was equal to 1 at the beginning of the experiment but it rapidly diminished as the respiration reached its maximum. The different salts which entered into the composition of the Knopp solution did not affect the respiration in the same manner. The potash salts were most active and where these were omitted the respiration was very low. Practically the same results were obtained with the nitrates.

The effect of temperature on carbon dioxid assimilation, G. L. C. Matthaei (*Ann. Bot., 16 (1902), No. 64, pp. 591, 592*).—An abstract is given of a paper presented before the British Association for the Advancement of Science, which shows the effect of temperature on the assimilation of various leaves. A number of leaves of the cherry laurel were kept for some time under exactly similar conditions, and the effect of temperature noted. The lowest temperature at which assimilation could be detected was -6° C., and this is said to be the first well-established case of assimilation taking place at a temperature below 0° C. For temperatures between -6° C. and 33° C., it was found that assimilation is affected in the same way as is respiration. If the illumination is sufficient the assimilation increases directly with the temperature. For temperatures above 33° C. the results are complicated by the injurious effects of temperature, and the death of the leaves took place at 41 to 45° as was shown by a rapid decrease in the respiration which ceases entirely after several hours.

Influence of previous environment in variety tests, T. L. Lyon (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 70–73*).—An account is given of a series of experiments with Turkish red wheat which was obtained from Ohio, Iowa, Kansas, and Nebraska and grown at the Nebraska Station. Although this variety is supposed to be a fairly constant one, wide differences are noted in the yield of grain and character of the plant grown from the different lots. The author believes that the habits of growth of the wheat plant are very readily changed by its environment and that a few years are sufficient to produce a great difference in this respect. While certain variety characteristics undergo slight changes others are deeply affected and reliable conclusions can not be based upon variety experiments in which the material is collected from regions differing widely in their climatic conditions.

The individuality of plants as a factor in nutrition studies, E. B. Voorhees and J. G. Lipmans (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 42–49*).—Attention is called to the importance of considering the individuality of the plant as a factor in plant studies, especially when but a few individuals are under observation. Examples are cited of pot experiments with several varieties of plants in which wide variations were noted in the growth and yield of the different plants. The conditions of the experiments were practically identical and the variation could be attributed only to the individuality of the plants. The aim of the paper was to emphasize the particular influence of plant individuality in plant nutrition studies so as to awaken suggestions as to the best means for reducing such influences to a minimum.

On the decomposition of proteid materials in plants, H. Karapétoff and M. Sabachnikoff (*Rev. Gén. Bot., 14 (1902), No. 167, pp. 483–486*).—It having been shown by several authors that the quantity of nondigestible proteid material in plants depends upon the respiratory energy, the authors conducted a series of experiments to investigate the effect of depriving plants of all sources of food to ascertain the effect on the transformation of nondigestible proteids. Young seedlings of wheat and barley were separated into equal lots, one of which was immediately analyzed and the other was kept in the dark for a considerable time, after which the plants were analyzed by the same method as used for the analysis of the fresh ones. The results of the experiments show that in the absence of nutrition the nondigestible proteid material in plants had decomposed very slowly. For a few days there was an increase, after which a gradual diminution of the total proteids of the plants.

The influence of wounds on the formation of proteid material in plants, J. Kovchoff (*Rev. Gén. Bot., 14 (1902), No. 167, pp. 449–462*).—Studies are reported on the effect of cutting bulbs on the production of nondigestible proteids in plants. Several varieties of onions were experimented upon, the bulbs being cut in half, one portion placed in a dark humid atmosphere and the other analyzed at once. The author found that wounding resulted in an increase in the nondigestible proteids. This increased in a greater proportion than the total proteids. In the absence of oxygen the nondigestible proteids made little or no increase when subjected to the other conditions of the experiment.

Investigations on vegetable oils and their formation, especially in the olive, C. Hartwich and W. Uhlmann (*Arch. Pharm., 240 (1902), No. 6, pp. 471–480*).—The authors describe the microchemical reaction of various vegetable oils, after which particular attention is given to the formation of oil in the fruit of the olive. The olive fruits were subjected to analyses from time to time during the growing season and the results of the analyses are given. The authors have divided the growing season into 3 periods: The first, in which there is but a very slight amount of oil present in the fruit; the second, which occurs from August to October, is a period of rapid oil formation; and the third, which occurs from October to February, is the period of ripening and the time at which the olives are mostly gathered. The oil content of the fruit increases up to January, after which there seems to be a decided decrease through that and succeeding months. The highest oil content of the fruits examined was 30.1 per cent for the flesh of the fruit, the analysis being made on January 16.

Pot experiments to determine the limits of endurance of different farm crops for certain injurious substances, F. B. GUTHRIE and R. HELMS (*Agr. Gaz. New South Wales, 14 (1903), No. 2, pp. 114–120*).—An account is here given of experiments with wheat plants grown in galvanized iron pots 8 in. high and 8 in. in diameter to test the effects on the growth of the plants of the following substances: Common salt (0.01 to 1 per cent), sodium carbonate (0.01 to 3 per cent), ammonium sulphocyanid (0.001 to 0.5 per cent), sodium chlorate (0.001 to 0.5 per cent), and arsenious acid (0.01 to 1 per cent). The results are summarized in the following table:

Effects upon germination and subsequent growth of the wheat plant of different percentages of injurious substances in the soil.

	Germination affected.	Germination prevented.	Growth affected.	Growth prevented.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Common salt	0.050	0.20	0.05 to 0.15 (recov.)	0.200
Sodium carbonate	.300	0.5 to 1	0.100	.400
Ammonium sulphocyanid	.005	.01	.001	.005
Sodium chlorate	Above .100	.05	.001	.003
Arsenious acid	.050	Above .50	.050	.100

Some modifications produced by freezing on the structure of plant cells, L. MATRUCHOT and M. MOLLIARD (*Rev. Gén. Bot., 14 (1902), Nos. 167, pp. 463–482; 168, pp. 522–533, pls. 3*).—Cytological studies are reported showing the effect of freezing upon many different plants. The phenomena described show a marked parallelism between the phenomena observed in desiccation and freezing, and the authors concur with Molisch that the death of the cell or plant by freezing is in reality due to the rapid drying out of the tissues.

The rate of absorption of nitrogen by cereals, J. HENRY (*Bul. Agr. [Brussels], 19 (1903), No. 1, pp. 154–156*).—A study was reported in which the author sought to learn the relative rate of nitrogen absorption from the soil in the case of barley, wheat, and rye grown in pots fertilized with nitrate of soda and sulphate of ammonia. The pots containing the plants were prepared in a similar manner, seeded, and specimens removed at stated intervals for analysis, the nitrogen being determined by the Kjeldahl-Jodbauer method. The results show that the period of absorption varies quite widely. For some time the absorption may be very slow and insignificant, while at other periods it is two or three times as active for the same length of time. During the most active periods of growth the nitrogenous fertilizers seem to be used most abundantly. For wheat the 2 periods of maximum absorption were between May 7 and 17, and the second at the time of the formation of the grain. With rye the maximum absorption took place between April 19 and 29 and between June 11 and 26, corresponding to the same periods of plant development as for the wheat. The maximum absorption of nitrogen for barley took place between June 12 and 26 at the time when the heads were appearing.

Recent investigations on the root tubercles of Leguminosæ, L. HILTNER and K. STÖRMER (*Arb. K. Gesundheitsamte, Biol. Abt., 3 (1903), No. 3, pp. 151–307,* *pls. 4, figs. 5*).—A brief review is given of the field trials with Nitragin prior to 1900, and the tests for that and the succeeding year are reported upon at considerable length. Of the tests conducted in various parts of the country during 1901 it is claimed that 54 per cent of all reported gave very favorable results. The experiments conducted at the Dahlem Station under the authors' direction gave almost uniformly increased growth when inoculated with pure cultures. Experiments were made in which the relative efficiency of treating the seed and the soil with solutions containing pure cultures was compared. A number of laboratory experiments are reported showing the effect of various factors on the development of root tubercles. Among the factors studied were the influence of the materials found in the endosperm of the seed; effect of grape sugar; various nitrogenous substances, such as saltpeter, asparagin, peptone, and combinations of these substances with grape sugar; the effect of phosphoric acid used alone and in combination with other substances; and effect of organic acids, etc., upon the root-tubercle organism. The value of pure cultures of the physiologically specialized organisms is also reported upon at considerable length. The paper concludes with some brief references to the investigations conducted during 1902 by the authors on the perfection of methods of inoculation.

Observations on some algæ causing "water bloom," N. P. B. Nelson (*Minnesota Bot. Studies, 3. ser., 1903, pt. 1, pp. 51–56, pl. 1*).—On account of the sanitary importance of some algæ in the sources of water supply the author has made a study of the species which produce the condition known as "water bloom" in a number of localities in Minnesota. So far as known there is no record of the occurrence of any of these injurious algæ to any great extent in the rivers or lakes supplying drinking water to the cities and towns of the State, but in several instances the death of cattle and other animals has been attributed to the presence of these organisms. As a result of the author's investigations 7 species of blue-green algæ which form water bloom are known to occur in the State, the species being as follows: *Glœotrichia pisum, Cœlosphærium kuetzingianum, Aphanizomenon flos-aquæ, Clathrocystis æruginosa, Anabæna circinalis, A. flos-aquæ, and A. mendotæ* (?). In several instances it has been almost conclusively proved that the presence of one or more of these species in drinking water used by stock has caused fatal results.

The suspension of life at low temperatures, A. Macfadyen and S. Rowland (*Ann. Bot., 16 (1902), No. 64, pp. 589, 590*).—An abstract is given of a paper presented by the authors before the British Association for the Advancement of Science, showing the results of experiments with various bacteria and other organisms, when subjected to the temperature of liquid air and liquid hydrogen. Altogether 10 organisms were cooled to a temperature of −190° C. for 7 days without producing any appreciable depreciation of their vitality either as to their growth or their other physiological or pathogenic properties. Later the organisms were subjected to temperatures of −252° C. by means of liquid hydrogen. In this case a number of different pathogenic and other organisms were subjected to this temperature for a period of 6 months and in no case was any reduction in the vitality of the organisms detected. After this period of subjection to low temperatures yeasts gave good growth and exhibited unaltered powers of fermentation. Typhoid bacillus retained its pathogenic and other properties while the other bacteria responded to the various tests applied to them. It appears that the ordinary manifestations of life cease at zero, but at −190° C. it is believed that even intracellular metabolism ceases as a result of the withdrawal of all heat and moisture from the organism.

The necessary presence of bacteria in cultures of Myxomycetes, Pinoy (*Bul. Soc. Mycol. France, 18 (1902), No. 3, pp. 288, 289; abs. in Bot. Centbl., 90 (1902), No. 11, p. 303*).—The author claims that it is nearly, if not quite, impossible to secure cultures of many Myxomycetes in pure media, but when the cultures are mixed in the presence of *Bacillus luteus* he has been able to successfully grow various stages of *Didymium effusum* and other forms.

METEOROLOGY—CLIMATOLOGY.

Report of the Chief of the Weather Bureau, 1901–2 (*U. S. Dept. Agr., Weather Bureau Rpt. 1901–2, pp. 342, charts 5*).—The first part of this report contains an account of the operations of the Weather Bureau during the year; part 2, a list of observing stations and changes therein during 1901, and hourly averages of atmospheric pressure, temperature, and wind from the records of automatic instruments at 28 stations; part 3, monthly and annual meteorological summaries for 171 Weather Bureau stations; part 4, monthly and annual means and extremes of temperature and dates of first and last killing frosts, 1901; part 5, monthly and annual precipitation, 1901; and part 6, miscellaneous meteorological tables and reports.

Annual summary of meteorological observations in the United States, 1902 (*Mo. Weather Rev., 30 (1902), No. 13, pp. VII + 603–633, pls. 22, charts 7*).—This number gives a table of contents, list of corrections, additions, and changes, and an index for volume 30; and a summary of observations on temperature, pressure, precipitation, wind movement, cloudiness, and other meteorological phenomena "based essentially upon data received from about 166 regular Weather Bureau stations, 33 regular Canadian stations, and voluntary stations from such States as have forwarded their annual summaries in time." The following special articles are included: The Red River Flood of November and December, 1902, by J. W. Cronk; Cannon and Hail, by J. R. Plumandon; and Studies among the Snow Crystals during the Winter of 1901–2, with Additional Data Collected during Previous Winters (illus.), by W. A. Bentley.

Meteorological chart of the Great Lakes, A. J. Henry and N. B. Conger (*U. S. Dept. Agr., Weather Bureau, Meteorological Chart of the Great Lakes, 1902, No. 2, pp. 17, charts 4*).—This is the usual summary of observations for the season of 1902 on storms, atmospheric precipitation, and lake levels, opening and closing of navigation, wrecks and casualties, fog, etc.

Meteorological observations, C. S. Phelps (*Connecticut Storrs Sta. Rpt. 1901, pp. 246–250*).—This is a record of observations on temperature, pressure, humidity, precipitation, and cloudiness during each month of 1901 at Storrs, and on rainfall during the 6 months ended October 31, 1901, at 22 places in Connecticut. The mean pressure for the year at Storrs was 29.98 in.; total precipitation 66.5 in.; number of cloudy days, 134. The average rainfall for the State during the 6 months ended October 31 was 27.80 in.

"The total precipitation for the year as recorded at Storrs . . . is the heaviest annual precipitation since the station began observations in 1888, being about 19.5 in. above the average (47 in.) for 13 years. The rainfall was exceptionally heavy during January, March, April, and May and again in July and December. . . . From the table of rainfall observations reported from 22 localities in the State, for the 6 months (May 1 to October 31), it will be noticed that the average rainfall for the State was quite heavy for each month except June. . . . The last killing frost occurred May 6, although the damage was not very general. . . . Frost held off well in the fall, the first to do much damage occurring September 26, thus giving a growing season of 142 days."

Meteorological observations, J. E. Ostrander and S. C. Bacon (*Massachusetts Sta. Met. Buls. 169, 170, 171, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during January, February, and March, 1903. The data are briefly discussed in general notes on the weather of each month.

Meteorological record for 1901 (*New York State Sta. Rpt. 1901, pp. 410–419*).—Tables are given which show the average monthly temperature and precipitation since 1882; the daily wind record for each month of 1901; a monthly summary of the direction of the wind for the year; tridaily readings of the standard air thermometer during each month of the year; a monthly summary of maximum, minimum, and standard thermometer readings; and daily readings of maximum and minimum thermometers at 5 and 6 p. m. for each month of the year.

Meteorological observations, D. V. C. Manso de Zuñiga (*Mem. An. Estac. Enol. Haro, 1902, pp. 51, 52*).—A summary is given of observations at this station during the year ended June 30, 1902, on atmospheric pressure, temperature, precipitation, humidity, evaporation, sunshine, cloudiness, and wind movement.

Meteorological tables, C. E. Magnusson (*Bul. Hadley Climat. Lab. Univ. New Mexico, 3 (1903), No. 5, pp. 14*).—Summaries, by months, of observations at the University of New Mexico on temperature, precipitation, cloudiness, and wind movement during 10 years (1893–1902).

The availability of New Mexico's climate for outdoor life, J. Weinzirl (*Bul. Hadley Climat. Lab. Univ. New Mexico, 3 (1903), No. 6, pp. 9*).

The climate of Garrett County, Maryland, O. L. Fassig (*Maryland Geological Survey: Garrett County. Baltimore: Johns Hopkins Press, 1902, pp. 252–273, figs. 7*).—A summary is given of all available records of temperature, frequency of frosts, cold waves, the hot days, rainfall and snowfall, cloudiness, thunderstorms, and wind direction. A list of meteorological stations in the county, giving location, organization, equipment, etc., is added. The data reported show that "in general the climatic conditions for maturing crops are perhaps less favorable here than in any other section of Maryland. Greater extremes of cold are experienced in the winter, while the growing season is much shorter. This is due principally to the considerable elevation of the county as compared with the other counties. Usually spring does not begin until the middle of April, although it begins in the early part of March in the southeastern part of the State. The highest recorded temperature is 99°, while the lowest is 26°, recorded at Sunnyside. These figures give an extreme range of temperature of 125°, probably the greatest range in the entire State. The mean daily range of temperature is about 20°, or slightly more than that of the State. The normal annual temperature of the county is 47°, while that of the State is between 53 and 54°. Frosts are possible in almost any month of the year, but during a period of 3 years ending 1898 the last frost in the spring occurred May 30, and the first frost in the fall, September 12. The normal annual precipitation for Garrett County is 53.3 in., of which about 28 in. fall during the spring and summer months. The annual precipitation is about 10 in. greater than the recorded rainfall of the rest of the State."

The climate of Cecil County, Maryland, O. L. Fassig (*Maryland Geological Survey: Cecil County. Baltimore: Johns Hopkins Press, 1902, pp. 249–261, figs. 3*).—A summary is given of all available data relating to temperature, rainfall, and snowfall.

A study of the climate of Tunis, G. Ginestous (*Bul. Dir. Agr. et Com.* [*Tunis*], *8 (1903), No. 26, pp. 103–139, figs. 11, charts 9*).—Previous articles (E. S. R., 14, p. 553) have summarized the meteorological conditions of Tunis by seasons. This article gives a detailed summary for the entire year.

Rainfall in the agricultural districts, C. L. Wragge (*Queensland Agr. Jour., 12 (1903), No. 2, p. 144*).—A table gives the rainfall of December, 1901, and of each month of 1902 at 41 stations in Queensland.

Analysis of the rainfall records of New South Wales generally, and also of those of other states, J. Barling (*Agr. Gaz. New South Wales, 13 (1902), Nos. 8, pp. 877–879, pls. 5; 12, pp. 1188, 1189, pls. 2*).—The analysis tends to show regularity or periodicity in rainfall variations for New South Wales, and that this region is now entering upon a favorable period as regards rainfall.

Investigation of the upper atmosphere by means of kites (*Jour. Soc. Arts, 50 (1902), No. 2602, pp. 858, 859*).—This is a report of the committee appointed by the Royal Meteorological Society to investigate this subject, and describes the apparatus installed and now in operation on the island of Crinan on the west coast of Scotland.

The use of barometric variations in forecasting weather, J. Guzman (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 17 (1902), No. 6, pp. 215–230*).—An argument based on actual observation to show that barometric variations are of great value in forecasting, since it is claimed that by their means the centers of high or low pressure may be predicted from 12 to 24 hours in advance; they aid in fixing the trajectories of cyclonic and anti-cyclonic centers; and they are of use in forecasting temperature changes and in predicting the north and south winds of northern Mexico and the Gulf region.

WATER—SOILS.

Water supply and sewerage (*Massachusetts State Bd. Health Rpt. 1901, pp. 1–393*).—This includes advice to cities and towns on water supply, sewage disposal, etc.; the results of chemical (and in some cases microscopical) examination of water supplies and rivers; and accounts of experiments on sewage purification and bacteriological studies at the Lawrence Experiment Station.

Purification of river water, A. J. J. Vandevelde and F. Leperre (*Reprint from Handel. Zesde Vlaamsch Natuur- en Geneesk. Cong., Kortrijk, 1902, pp. 11, figs. 2*).

The hydrography of Garrett County, Maryland, H. A. Pressey and E. G. Paul (*Maryland Geological Survey: Garrett County. Baltimore: Johns Hopkins Press, 1902, pp. 275–289, pl. 1, figs. 3*).—A summary of available data on this subject.

The hydrography of Cecil County, Maryland, H. A. Pressey (*Maryland Geological Survey: Cecil County. Baltimore: Johns Hopkins Press, 1902, pp. 263–287, pl. 1, figs. 8*).—A summary of available data on this subject is given in tables and diagrams.

On the processes of mineralization of water as related to the geological character of soils and rocks, E. Casoria (*Ann. R. Scuola Superiore Agr. Portici, 2. ser., 4 (1903), pp. 197*).

Observations on soil moisture in New Mexico from the hygienic view point, C. E. Magnusson (*Bul. Hadley Climat. Lab. Univ. New Mexico, 3 (1902), No. 4, pp. 8*).—Observations with Whitney's electrical apparatus and by means of direct determination (drying) are recorded for a period of about one year and the results are discussed with reference to health.

An experiment on soil improvement, C. S. Phelps (*Connecticut Storrs Sta. Rpt. 1901, pp. 148–153*).—A brief account is given of a continuation of a rotation experiment begun in 1899 (E. S. R., 13, p. 935). "The experiment on soil improvement in 1900 was with potatoes and that of 1901 with oat and pea hay. In both years the yield was largest on the plat with the complete fertilizer, but in proportion to the cost of fertilizing the two plats the yield on the plat with the stable manure was fully as economically produced. In 1900 the yield from the plat with clover for manure was next in size to that from the plat with the complete fertilizer, and the yield from the plat with the minerals and clover for fertilizer was practically the same as that from the stable manure. In 1901 the yields of oat and pea hay where a light growth of vetch was plowed under, either alone or in combination with the mineral fertilizers, were much smaller than those where stable manure was used. In both years the yield on the plat where rye was plowed under in addition to the minerals was less than those from the plats on either side where the legumes were used. The results of both years indicate a considerable advantage in the use of legumes for green manure. On the whole, common red clover seems to be the best crop for the purpose of green manuring when it must be grown between the regular crops of a rotation, as in the experiment here described."

Experiments on black marsh soils, A. R. Whitson (*Wisconsin Sta. Rpt. 1902, pp. 210–216, figs. 2*).—In continuation of previous investigations (E. S. R., 13, p. 931), experiments were made on black marsh soils in 1901 (1) in cylinders which showed that green manure was nearly as effective as potash for corn on such soils; (2) in cylinders and in the field which showed that "the effect of potassium sulphate is limited to the first crop, while manure may influence the second crop largely and the third somewhat. With the ordinary distance of planting of corn, 50 to 75 lbs. [of potassium sulphate] per acre would appear to be the most profitable amount to use. In order not to prevent germination, this must be placed from 1 to 2 in. below or at one side of the seed in the hill."

The soils of Garrett County, Maryland, C. W. DORSEY (*Maryland Geological Survey: Garrett County. Baltimore: Johns Hopkins Press, 1902, pp. 233–252, pls. 2*).—An account is here given of a soil survey of this county, which lies in the extreme western portion of Maryland and has an area of 680 square miles. It consists mainly of a rolling plateau 2,000 to 2,500 ft. above sea level, broken by mountain ranges 2,500 to 3,400 ft. high. The article contains a general discussion of the origin and fertility of soils and of the relation of the agriculture to the physiography and climate of Garrett County, agricultural conditions, the history of soil investigations in the county, and soil formations. "There are comparatively few types of soil in Garrett County. They consist mostly of sandy loams and loams in the valleys and more gently rolling areas. In the mountainous districts there are always present large amounts of bowlders, which make cultivation difficult. The soils are mainly residual, derived from the weathering of the shales, sandstones, and limestones." The type soils which are described, and of which mechanical analyses are given, are 10 in number, as follows: Jennings, Hampshire, Pocono, Greenbrier-Mauch Chunk, Pottsville, Allegheny, Conemaugh, Monongahela, Dunkard, and Quaternary.

The soils of Cecil County, Maryland, C. W. DORSEY and J. A. BONSTEEL (*Maryland Geological Survey: Cecil County. Baltimore: Johns Hopkins Press, 1902, pp. 227–248, pls. 3*). –This is an account of a soil survey which has already been noted from another source (E. S. R., 13, p. 925).

Preliminary crop and soil data for the cooperative study of available plant food, C. C. MOORE (*U. S. Dept. Agr., Bureau of Chemistry Circ. 11, pp. 9*).—This circular gives a description of the soils on which a chemical study (E. S. R., 13, p. 1014) has been made in different States by the experiment stations cooperating with the Bureau of Chemistry of this Department, and analytical data for the yield and fertilizing constituents of the crops grown.

Report on analyses of the soil of coffee plantations, J. G. KRAMERS (*Meded. 'S Lands Plantentuin, 1902, No. 57, pp. 25*).—The author discusses the subject under the following heads: (1) The origin and nature of coffee soils in Java; (2) the relation between the soil and the plants; (3) the chemical analysis of the soil; and (4) the samples and the methods of investigation. Following the text is a long table, in which is given detailed analyses of all the soil samples, together with the reagents used in making the tests. The soils on which Java coffee is planted belong to the volcanic formation of the Tertiary and Quaternary periods, and consist of volcanic andesite and basalt or their decomposition products. Most of the cultivated soils of Java are underlaid by a hardpan which often prevents free drainage and ruins the soil for coffee culture.

The author also treats of the various mineral substances in the soil and the geological history of the mountains, and discusses the general principles of plant physiology as applied to the relation between the plant and the soil.—H. M. PIETERS.

The occurrence of climatic soil zones in Spain, RAMANN (*Ztschr. Ges. Erdk., 1902, pp. 165–168; abs. in Geol. Centbl., 3 (1903), No. 4, p. 136*).—On the basis of observations made during 1901 the author maps and discusses the distribution of soils in the Spanish Peninsula. Soils having the widest distribution are the steppes and half steppes, some of which are alkaline. A special type of the steppe soils is the Andalusian black soil, which differs in structure from the east European soils. The steppes are surrounded by a band of red siliceous soils containing considerable amounts of colloidal iron oxid. On the northwest coast, where the rainfall is abundant, humus soils are found.

The bacteriological analysis of soils, F. D. CHESTER (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 173–182*).—This article is based on investigations already noted (E. S. R., 14, p. 232).

FERTILIZERS.

Culture trials with precipitated calcium phosphate, II, J. G. SÖDERBAUM (*Medd. K. Landtb. Akad. Exptlfält.* [*Stockholm*], *1902, No. 75, pp. 14*).—The trials here reported are continuations of those conducted during the summer of 1900 (E.S.R., 13, p. 836). The general plan of the trials was to ascertain the fertilizer value of tricalcium orthophosphate prepared from apatite through electrolysis, as compared with other phosphatic materials. The new series of trials were conducted during 1901 with 5 different phosphatic fertilizers, viz.: (1) Tricalcium phosphate prepared from "apatite concentrate," with sodium chlorate as electrolyte, and dried at 80° C. It contained 47.09 per cent lime, 0.76 per cent potash, and 34.30 per cent phosphoric acid, 28.38 per cent of phosphoric acid soluble in 2 per cent citric-acid solution, and 5.60 per cent soluble in Petermann's ammonium-citrate solution. (2) Dicalcium phosphate, prepared electrolytically (with sodium chlorate) from so-called "slig" (apatite, iron ore, etc.). It contained lime 38.53 per cent, phosphoric acid 39.91 per cent, citric-acid soluble phosphoric acid 37.23 per cent, and citrate-soluble phosphoric acid (Petermann's solution) 33.52 per cent. (3) Precipitated phosphate, essentially a mixture of dicalcium and tricalcium phosphates, with 41.36 per cent total and 24.12 per cent citrate-soluble phosphoric acid. (4) Steamed bone meal, containing 21.39 per cent total and 20.27 per cent citric-acid soluble phosphoric acid, with 4 per cent nitrogen. (5) Superphosphate (same as used in the first series) containing 17.6 per cent water-soluble phosphoric acid.

The field used for the experiments was a poor sandy soil, with 0.336 per cent lime, 0.025 per cent potash, and 0.039 per cent phosphoric acid (soluble in hot hydrochloric acid of sp. gr. 1.15). In order to further investigate the comparative effect of the different phosphates with or without an extra supply of lime in the soil (E. S. R., 12, p. 323), applications of similar amounts of the different fertilizers were always made in duplicate, one series receiving lime and the other no lime. The crop used was oats, which were sown in glass cylinders, 49 cm. high and 24 cm. in diameter. The basal fertilization applied was at the rate of 300 kg. of potash, 100 kg. of nitrogen, and 33 kg. each of common salt and magnesium sulphate per hectare. The precipitated, dicalcic phosphates and superphosphate were added in three different quantities, viz, at the rate of 50, 100, and 150 kg. of citrate or water-soluble phosphoric acid, and the other phosphates at the rate of 100 kg. of phosphoric acid per hectare. Six parallel tests were made with each fertilization, of which 3 were made with lime (333 kg. of calcium carbonate in the form of finely powdered marble per hectare), and 3 without lime.

The results obtained showed that the liming in itself, without accompanying addition of phosphoric acid, produced a considerable increase in yield—on the average for all series, 100:163.1. The following statement presents the main average results of the trials, taking the results on the "no phosphoric acid" and "no lime" plats as 100:

Comparative effect of different phosphates, with and without lime, on oats.

	No lime.	Lime.	No lime.	Lime.
No phosphoric acid	100	163	100	163
50 kg. of phosphoric acid per hectare in superphosphate	1,002	1,013	100	101.3
100 kg. of phosphoric acid per hectare in superphosphate	1,038	1,060	100	102.3
150 kg. of phosphoric acid per hectare in superphosphate	1,092	1,071	100	97.9
50 kg. of phosphoric acid per hectare in dicalcium phosphate	1,010	926	100	90.7
100 kg. of phosphoric acid per hectare in dicalcium phosphate	1,032	1,010	100	97.7
150 kg. of phosphoric acid per hectare in dicalcium phosphate	1,027	1,042	100	101.6
100 kg. of phosphoric acid per hectare in precipitate	1,007	1,008	100	100.2
100 kg. of phosphoric acid per hectare in tricalcium phosphate	607	271	100	33.4
100 kg. of phosphoric acid per hectare in bone meal	790	229	100	18.7

The results of the trials corroborate those of Kellner and Böttcher in showing that the favorable effects of bone meal are considerably decreased by liming, viz. as much as 81 per cent. They also show that a similar decrease took place in case of precipitated calcium phosphate (66.5 per cent decrease). The results obtained differ from those of the scientists mentioned in so far as the effect of the superphosphate was not materially influenced by the addition of the lime, possibly because the author used less lime.

The effect of liming on the action of bone meal is discussed by the author. He calls attention to the fact that the fertilizing value of neutral phosphates only was reduced by the addition of lime, and suggests that the calcium bicarbonate formed in soils rich in lime by the action of water containing carbonic acid in solution on calcium carbonate may be responsible for the phenomenon, since the water containing this salt in solution does not dissolve tricalcium phosphate to the same extent as does water containing free carbonic acid.

The residuary effect of tricalcium phosphate was studied during 1901 with the cylinders used in the experiments of the preceding year. Although the phosphoric acid in the tricalcium phosphate only slightly improved the crop harvested during the first season, its effect during the following season was insignificant, and was decidedly less than during 1900 and less than the residuary effect of Thomas phosphate during the season of 1901.

As regards the value of the two electrolytically prepared phosphates, the conclusions drawn are that triphosphate on soils poor in lime produced somewhat lower results than did bone meal and on freshly limed soils somewhat better results, and that dicalcium phosphate proved to possess much the same fertilizer value as superphosphate, without regard to whether the soil was limed or not.—F. W. WOLL.

The action of phosphoric acid in the presence of lime, BACHMANN (*Fühling's Landw. Ztg., 52* (*1903*), *No. 1, pp. 12–14*).—Plat experiments with rye, oats, and beets on sandy soils fertilized with superphosphate, Thomas slag, and bone meal with and without the addition of lime are reported. The most profitable returns were obtained with Thomas slag, the least profitable with bone meal. The results showed in general that the use of lime in connection with superphosphate and bone meal resulted in little or no reversion of the phosphoric acid during the first year.

The effect of moisture on the availability of dehydrated phosphate of alumina, F. W. MORSE (*Jour. Amer. Chem. Soc., 25* (*1903*), *No. 3, pp. 280–288*).—It is stated that a patented process for preparing dehydrated alumina and iron phosphate for use as a fertilizer by heating to about 325° C. was described by S. L. Goodale in 1893. Dehydrated phosphate shows a high solubility in ammonium citrate, although pot and field tests have not borne out the laboratory indications of availability. An account is here given of determinations of the progress of dehydration of Redonda phosphate heated to different temperatures—100, 150, 250, 325, 560, 830° C.—of the absorption capacity for water of the different samples so heated, and of the solubility in neutral ammonium citrate of the phosphoric acid of the undehydrated and dehydrated material as well as of samples which had been dehydrated at different temperatures and then allowed to absorb moisture. The results indicate that dehydration is not complete at 325° C., but that a temperature of 560° gives a product which is completely dehydrated, absorbs water more slowly, and for this reason remains soluble in ammonium citrate longer than phosphate heated to lower temperatures. Whether this resistance to hydration will render the phosphate actually more available to plants remains to be determined.

The action of phosphatic fertilizers on the chemical composition of forage plants, L. BONETAT and P. TOUCHARD (*Jour. Agr. Prat., n. ser., 5* (*1903*), *No. 11, pp. 343–345*).—The results of a number of experiments with grasses and leguminous plants are reported to show that the application of phosphatic fertilizers not only improves the yield and quality of the forage, but increases their phosphoric acid content.

Pot experiments with nitrogenous fertilizers in 1901, C. S. PHELPS (*Connecticut Storrs Sta. Rpt. 1901, pp. 154-164*).—This is a report of a continuation of experiments carried on for several years (E. S. R., 13, p. 935). The results of pot experiments during 1901 with meadow fescue, Hungarian grass, barnyard millet, and soy beans are reported in detail. "The purpose of the pot experiments was to study the effects of nitrogenous fertilizers on the percentages of nitrogen and protein in some of our common farm crops. In this respect they are similar to the field experiments with nitrogenous fertilizers which the station has conducted during the past 12 years. . . . The results of the past 3 years' experiments indicate that our common grasses, such as orchard grass and meadow fescue, are greatly increased in the percentages of nitrogen and of protein by the nitrogen used as a fertilizer. Similar results were obtained with Hungarian grass and millet. The only cereal that has been grown in these experiments is oats. While the experiment has not been fully satisfactory, the increase in percentage of protein was much larger where the larger quantities of nitrogen were used as fertilizer. The only legume which has been successfully grown is the soy bean. The seed of this plant was but little increased either in total weight of crop or in the percentage of nitrogen by the nitrogen used as fertilizer."

Nitrate of soda and sulphate of ammonia, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 5 (1903), No. 10, pp. 308, 309*).—The relative fertilizing effect of these two sources of nitrogen as indicated by experiments by Wagner and the author is discussed. Wagner's experiments, which have extended over a number of years, indicate that the nitrogen of sulphate of ammonia is about 90 per cent as effective as that of nitrate of soda. The author's experiments give considerably lower figures for the nitrogen of sulphate of ammonia, namely, 86 per cent, falling to 80 per cent in soils very poor in lime and to 63 per cent in soils very rich in lime.

The action of 40 per cent potash salt and kainit on summer crops, H. BACHMANN (*Deut. Landw. Presse, 30 (1903), No. 15, p. 120*).—The results of the experiments with various crops here reported indicate that when applied in the spring the 40 per cent salt was in the majority of cases somewhat superior to kainit, but that the latter had a more lasting effect. With winter applications the kainit for the latter reason gave better results, especially on beets. At local market prices the kainit was more economical than the 40 per cent salt.

Top-dressing with potash on sandy soils, BACHMANN (*Fühling's Landw. Ztg., 52 (1903), No. 3, pp. 102, 103*).—Good results were obtained with rye even when the top-dressing was delayed until the end of May. The results, however, were not as good as when the potash salt was applied before seeding.

Dried blood, E. M. PAGET (*Amer. Fert., 18 (1903), No. 2, pp. 5-7*).—The details of the preparation of this product are described.

Concentrated tankage, E. M. PAGET (*Amer. Fert., 18 (1903), No. 3, pp. 14-17, figs. 2*).—The methods of preparing this fertilizing material are discussed.

Report of observations on the peat industry in Canada, J. G. THAULOW (*Indberetning om en med offentligt stipendium sommeren 1901 foretaget reise for at studere torvdrift i Kanada m. fl. lande. Christiania, 1902, pp. 26, pls. 8*).

Report of observations on the peat industry in European countries, A. DAL (*Indberetning om en reise sommeren 1901 for at studere torvdrift i forskjellige europæiske lande. Christiania, 1902, pp. 20, pls. 10*).

On the composition and use of flotsam, F. P. BONUCCELLI (*Staz. Sper. Agr. Ital., 36 (1903), No. 1, pp. 5-24*).—The fertilizing value of the refuse (leaves and similar material) which accumulates at certain points along the banks of streams and shores of other bodies of water is discussed and numerous analyses are reported.

Analyses of commercial fertilizers, M. A. SCOVELL and H. E. CURTIS (*Ken-*

tucky Sta. Bul. 104, pp. 247-281).—Analyses of 334 brands of commercial fertilizers examined during 1902 are reported, with a brief discussion of methods and results of the inspection.

Analysis of commercial fertilizers sold in Maryland, H. B. McDonnell et al. (*Maryland Agr. College Quart., 1903, No. 19, pp. 48*).—The results of analyses of 498 samples of fertilizers examined from August, 1902, to January, 1903, are reported.

Analyses of licensed fertilizers, 1902, F. W. Woll and G. A. Olson (*Wisconsin Sta. Rpt. 1902, pp. 247-250, 285, 286*).—Analyses of 11 samples are reported, with brief notes on the results of inspection. The text of the State fertilizer law is also given.

Fertilizers licensed for sale in Wisconsin in 1903, F. W. Woll (*Wisconsin Sta. Bul. 99, pp. 5, 9, 10*).—The text of the State fertilizer law is given, with guaranteed composition of 13 brands of fertilizers licensed for sale in 1903.

FIELD CROPS.

Field experiments with fertilizers, C. S. Phelps (*Connecticut Storrs Sta. Rpt. 1901, pp. 122-147*).—The work here reported comprises special nitrogen experiments with corn, cowpeas, and soy beans, and a soil test with different fertilizers on crops grown in rotation. The work is repeated yearly with the same fertilizers on the same plats. The reports of former years together with a description of the experiments have been previously noted (E. S. R., 12, p. 936).

The results with corn indicate that mineral fertilizers are very essential to the crop but insufficient when used alone. The complete fertilizer was found essential for good yields. The most profitable results, considering the yields alone, were obtained with 25 to 50 lbs. of nitrogen per acre in the form of nitrate of soda used with mineral fertilizers. When the feeding value of the crop is taken into consideration even larger quantities of nitrogen than 50 lbs. per acre are believed to be profitable. The use of nitrogen beyond 50 lbs. per acre did not generally produce a marked increase in the dry matter but the percentages of nitrogen and of protein in the grain and the stover were highest where the largest quantities of nitrogen had been used in the fertilizers.

Experiments with cowpeas and soy beans show that mineral fertilizers are effective in increasing the yields. The addition of nitrogenous fertilizers had but little effect on the yield or the percentage of protein in the crop. The average results of the experiments thus far made at the station with cowpea fodder show practically no advantage over the use of nitrogenous fertilizers. With soy beans the use of nitrogen in the fertilizer application produced a small increase in the yield of seed In both crops the protein was increased but little, if any, by the use of nitrogenous fertilizers.

The results of the soil test with crops in rotation for 1901 showed that while the mineral fertilizers were of greater value than nitrogen in increasing the yield of soy beans, nitrogen was of more value when supplied in the form of manure. While a complete fertilizer gave an increase of only 2 bu. per acre over the yield where only mineral fertilizers were used, manure gave an increase of nearly 9 bu. The general results for the past 12 years show that nitrogen and phosphoric acid are of prime importance on the station soil for good yields of oats. These same elements were most effective where corn was grown in rotation. Potatoes responded more generally to the use of potash.

Fertilizer experiments with wheat and barley, G. P. Foaden (*Jour. Khediv. Agr. Soc. and School Agr., 4 (1902), No. 5, pp. 177-183*).—Cooperative experiments were conducted to test the value of nitrate of soda, superphosphate, and barnyard manure as fertilizers for wheat and barley. The results indicate that on land of moderate quality nitrate of soda was an effective and profitable fertilizer for wheat. Barnyard manure did not appear remunerative, probably because the application did not have sufficient time to become effective, and for this reason barnyard manure is considered better adapted to the cotton crop. The increase in yield due to the use of superphosphate was not adequate to repay the cost of the fertilizer.

Relation of crop production to amount of water available and methods of cultivation, A. R. WHITSON (*Wisconsin Sta. Rpt. 1902, pp. 187–191*).—This work is in continuation of rotation and irrigation experiments previously noted (E. S. R., 13, p. 936). The yields of the different crops are given, and the distribution of rainfall during the growing season for 21 years is shown in a table. The rotation is oats seeded to clover, clover, potatoes on manured clover sod, and corn. The rainfall was so plentiful this season that irrigation became unnecessary.

The results with corn showed that the growth of ears and stalks were greater during the wet and cold season of 1902 than during the hot and dry season of 1901, when the deficient rainfall was supplemented by irrigation. In 1902 larger yields of corn were obtained from manured and unmanured plats which had never been irrigated than from similar plats which had been irrigated in previous years. This result is considered due to the reduction of fertility by the growth of larger crops under irrigation during the dry season, or to the washing of the irrigated soil.

The yield of potatoes was smaller than the year before when the ground was irrigated. Potatoes grown in rotation yielded 342.8 bu. per acre, while a crop on old alfalfa sod, but otherwise treated the same, gave only 277.7 bu. per acre.

The author assumes that under the existing climatic conditions 18 in. of rainfall during the growing season is sufficient for corn and potatoes, 12 in. for oats, and 24 in. for hay. On this basis there has been a shortage of 4 in. or more in 10 of the past 21 years during the corn and potato season, in 12 years during the hay season, and in 4 years during the oat season.

The results of an experiment showed that the soy bean plants used 527 lbs. of water per pound of dry matter produced. In previous determinations made at the station it was found that corn used 270.9 lbs. of water per pound of dry matter produced, oats 503.9 lbs., and clover 576.6 lbs. The soy beans yielded 7,980 lbs. of dry matter per acre, equal to 9,177 lbs. of hay with 15 per cent of moisture, and the quantity of water used was 18.68 in.

Influence of the soil on the protein content of crops, A. R. WHITSON, F. J. WELLS, and A. VIVIAN (*Wisconsin Sta. Rpt. 1902, pp. 192–209, figs. 5*).—Experiments were conducted in the field and the plant house to determine the influence of the soil on the protein content of corn, oats, barley, rape, and cowpeas. The nitrate was furnished the soil in some instances as a solution of nitrate of soda and in others as leachings from a very rich soil. In each test the amount of nitrate in the soil was determined at 2 or 3 stages previous to and at the time of making the determination of the protein in the plant. The results obtained by other workers along this line have been previously noted.

Oats were sown in jars on March 29 and the soil in some jars watered with lake water containing no nitrates, in others with an amount of leachings of a rich plant-house soil with the lake water, and in a third group with the same leachings twice as strong. It was found that the amount of nitric nitrogen in the plant decreased greatly between May 6 and 21 in the plants growing in the poorest soil, while it increased slightly in the plants growing on soil of medium fertility, and much more in those on the richest soil. The proteid nitrogen in the entire plant May 21 on the poorest soil amounted to 1.93 per cent, on the medium soil 2.53 per cent, and on the richest soil 2.66 per cent. The percentage of protein was 31.09 larger in the crop grown on ground of medium fertility and 37.8 larger in the crop grown on the most fertile soil than in that on the poorest soil.

Rows of oats and rape were planted on 3 sandy plats in the plant house on March 15. The first received no fertilizer, the second a small amount of sodium nitrate, and the third double this amount. The nitric nitrogen in the plants decreased from the first in those receiving no fertilizer, increased rather strongly in the second plat at first but decreased largely as the plants matured, while the third plat showed a slight decrease toward the end. On June 6, when the oats were in bloom, the percentage of proteid nitrogen on the first plat was 1.29, on the second plat 1.63, and on the third 1.70, corresponding to 8.06, 10.19, and 10.63 per cent of protein, respectively. This shows a gain in the percentage of protein of 26.3 for the smaller amount of nitrate fertilizer, and 31.88 for the larger amount. The analyses of the ripe seed taken July 1 show a percentage of proteid nitrogen of 2.57 on the first plat, 2.79 on the second, and 2.77 on the third.

Corn was grown in the field on manured and unmanured plats and on soil planted to potatoes on clover sod the year before. There was a considerable difference in the amounts of nitric nitrogen in the soil water of the manured and unmanured plats as determined July 8 and 29. This result is considered due to the actual difference in the soil fertility, the growth of the crop, and leaching rains. The amount of nitrates was largest in the unmanured soil and the percentage of nitrates and of proteid nitrogen in the plant was also greater on the unmanured land. The manure decreased the percentage of protein in the crop but produced the greater total amount. "Contrary to the general rule, the plants which made most vigorous growth contained the smaller percentage of protein. It would seem that the stimulating influence of the manure had been chiefly due to something other than the nitrogen it contained, or at least to the nitrogen supplied the plant in the form of nitrates." Corn following potatoes on clover sod in rotation contained a larger percentage of protein than the crop from the manured plat. Corn grown near trees contained 0.97 per cent of proteid nitrogen on August 18 as compared with 1.31 per cent in corn not affected by trees. On September 5 the result was 0.86 and 1.09 per cent, respectively.

An experiment with corn grown with oats and rape was made in the plant house on 3 plats arranged and treated as described under the experiments with oats. "The results of this experiment would point toward four conclusions: (1) That the percentage of protein in the plant is dependent directly on the amount of nitrates in the soil; (2) that corn on different fields may make very nearly equal growth while differing materially in percentage of protein produced; (3) that beyond a certain point the percentage of protein is not increased by excess of nitrates; and, (4) that in the presence of a sufficient amount of nitrates in the soil, variations in the growth of the plant are caused by the amounts of salts in the soil other than nitrates." The corn on plat 1 contained 8.44 per cent of protein; on plat 2, 9.94 per cent; and on plat 3, 11.25 per cent.

Cowpeas were grown in jars under the treatment that was given oats grown in the same way. The fertilizers applied produced a greater effect on the growth of the plants with cowpeas than with any other crop in these experiments. The percentage of nitric and proteid nitrogen in the dry matter was largely in favor of the plants having received the largest amounts of fertilizer. The soil did not contain tubercle-forming bacteria, and plants inoculated about August 1 on the South Carolina cowpea soil had their roots well covered with tubercles when examined in October. In a field test cowpeas were grown on an inoculated and on an uninoculated plat. The inoculated plat had produced a crop of cowpeas the year before. The nitric nitrogen in the plants from the inoculated plat on August 15 amounted to 0.691 per cent and in those from the uninoculated plat 0.265 per cent. In samples of the entire plant above ground taken September 13 there was a difference of 48 per cent in the proteid nitrogen in favor of the inoculated plat. The causes to which this difference is due are as yet undetermined.

Rape grown indoors under the same conditions as oats and corn showed an increase of 11.40 and 13.445 per cent of protein on the second and third plats, respectively, as compared with the first plat which received no fertilizer. The results indicate that the amount of nitric nitrogen given the second plat was apparently all that the plant could utilize in the formation of protein.

Experiments with grain and forage plants, 1902, R. A. Moore (*Wisconsin Sta. Rpt. 1902, pp. 217–240, figs. 4*). An account is given of the weather conditions of the season and of the results obtained in the culture of a number of varieties of grains. Severe storms in June and July injured the small grains grown to such an extent that data as to yields per acre, etc., have been omitted from the report. Of 11 varieties of barley grown, Mansbury and Oderbrucker, both 6-rowed varieties, led in yield and general excellence. Seventeen varieties of oats were grown, and of these Swedish oats have given the best results for a period of 4 years. In many instances the yield with this variety has exceeded 80 bu. per acre. This variety of oats was obtained through the U. S. Department of Agriculture, and it is believed that its introduction in Wisconsin will raise the average yield several bushels per acre. Petkus and Schlansted, varieties of rye imported from Germany, have yielded from 29 to 41 bu. per acre during 2 seasons.

From 2 to 10 tons of green forage or 2 to 3 tons of cured hay have been obtained from an acre of soy beans at the station. The station experiments indicate that soy beans for hay in that region should be sown broadcast at the rate of about 1 bu. of seed per acre, and the crop cut on the appearance of small pods. If seed is desired it is best to sow the grain in drills 30 in. apart, dropping the seed about 4 in. apart in the row. It can be planted later in the season and appears to give better results at the station than cowpeas. Very good results were obtained when the soy beans were planted with corn for silage. Out of 8 varieties of soy beans tested Medium Early Yellow gave the highest yield, 38 bu. per acre, followed by Ito San, 33.7 bu. per acre, and Michigan Green, 26.7 bu. per acre. The growing period of the first two was 136 days and of the last 162 days. No tubercles were produced on the roots of the soy beans grown at the station until after the soil had been inoculated. Six varieties of cowpeas were grown at the station to determine their value for forage and seed production. The varieties Red Ripper and New Era gave the best returns, yielding 10.8 and 13.7 bu. per acre, respectively. The varieties did not ripen evenly and a number of the varieties sown failed to ripen seed at all.

Common varieties of alfalfa at the station have quite generally winterkilled and in other instances have been crowded out by weeds and grass. Turkestan alfalfa has proved much hardier and given better results. The best results were secured when the Turkestan alfalfa was seeded with oats as a nurse crop. The oats were sown at the rate of about 1 bu. per acre and seemed to aid in keeping down the weeds. Cutting alfalfa earlier than it is usually cut for hay seemed to have a detrimental effect upon the crop, reducing the yields. Three crops were cut during the season and gave an average total yield of 4.5 tons of hay per acre. An effort was made to produce seed from the second cutting but only an occasional seed was formed, though the plants flowered profusely. Summing up the results obtained with alfalfa, the author believes that to obtain a good catch in Wisconsin the crop should be seeded in the spring on fall-plowed land as soon as the ground can be put in good condition. If the ground is inclined to be weedy it should be seeded with a nurse crop of oats. Should the oats be inclined to lodge they should be cut, as otherwise they will smother the alfalfa. On very clean ground alfalfa may be sown without a nurse crop.

A test was made of 16 varieties of clover. Of this number Missouri, Minnesota, Nebraska, Michigan, and English No. 12,174 gave the best results. Hungarian grass (*Bromus inermis*) has been found to start 2 weeks in advance of the more common grasses and to furnish pasturage 2 or 3 weeks longer in the fall. The hay produced is inferior to that of timothy and the yield is not as heavy. In dry weather it withers and remains dormant several weeks.

Hairy vetch gave a cutting of 3 tons of hay per acre. On the rich soil of the station it is inclined to lodge badly. Its trailing nature makes it difficult to harvest and causes the portions next to the ground to decay, making them unfit for stock. It makes a fine fall and early spring pasture when sown with winter rye.

Flax was sown during the season, but was destroyed by an undetermined disease. Early Amber sorghum, seeded July 18, in rows 18 in. apart, at the rate of 2 pk. of seed per acre, yielded about 9.75 tons of cured forage per acre. It has been a very satisfactory soiling crop for cows, but should not be cut until it begins to tassel, as previous to that time it is not so palatable to stock.

Experiments in treating oat seed for smut with 1 lb. of formaldehyde to 50 gal. of water, 1 lb. to 25 gal. of water, and 1 lb. to 10 gal of water, respectively, indicate that none of these strengths is injurious to the germinating properties of the seed. Any of these solutions is a very effective remedy against oat smut. The seed should be submerged in the solution for at least 20 minutes and then spread out to dry. Wet seed will not work well in a grain drill, but if it must be used the drill should be set to sow 1 bu. more per acre than when sowing dry oats.

Work in plant breeding at the station under way is briefly noted.

Cultivated forage crops of the Northwestern States, A. S. Hitchcock (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 31, pp. 28, pls. 7*).—This bulletin presents a brief discussion of the forage resources in that portion of the country extending from Colorado and central California to Montana and Washington. This area is divided into the Great Plains, Rocky Mountain, Great Basin, Interior Valley of California, upper Pacific coast, and Palouse regions. The forage conditions in these different regions are considered separately. The crops of greatest importance are alfalfa, timothy, redtop, awnless brome grass, velvet grass, and clovers, and those of minor importance, Kentucky blue grass, orchard grass, cheat, perennial rye grass, rape, field peas, and vetches. The value of each of these crops is pointed out. Alfalfa is discussed at some length with reference to its general conditions, its feeding value, and the methods of seeding and hay making. Notes are also given on the use of grain for hay and the methods and advantages of baling hay.

Alfalfa, its chemical development, H. Snyder and J. A. Hummel (*Minnesota Sta. Bul. 80, pp. 149–171, figs. 6*).—A description of alfalfa is given, together with directions for the culture of the crop. The observations of a number of farmers with reference to alfalfa growing are reported.

The chemical development of the plant was studied at the station. Samples of 1 sq. yd. each of Western alfalfa were taken on June 3, 10, and 24, and of Turkestan alfalfa on June 3 and 10, and analyzed. The samples taken June 3, when the first blossoms were just appearing, contained the highest percentage of total nitrogen and proteid nitrogen and the least percentage of fiber. The results of the analyses and the number of grams of nutrients yielded by 1 sq. yd. at the different stages are tabulated.

Analyses of similar samples of the second crop taken June 30 and July 7, 14, 22, and 29 in general corroborate the results of previous experiments. The total nitrogen and ether extract decreased regularly and the fiber increased as the growth of the crop progressed. "The crop reaches the condition most suitable for cutting at the time when one-third of the blossoms have appeared. After this a larger amount of much inferior hay is obtained."

The proportion of dry matter in the leaves and stems was determined in samples taken at intervals of 4 days from June 3 to June 30. The analyses of the dry matter of these samples is given in the following table:

Analyses of the dry matter of the leaves and stems of alfalfa at different stages of growth.

	Time of cutting samples.						
	June 3.	June 7.	June 11.	June 16.	June 21.	June 25.	June 30.
Leaves:	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Dry matter	21.90	30.84	28.36	32.44	34.18	32.70	59.10
Total nitrogen	4.36	3.66	3.73	3.12	2.74	2.74	2.77
Proteid nitrogen	3.69	3.02	3.33	2.51	2.17	2.18	2.17
Per cent proteid to total nitrogen	84.69	82.74	89.20	80.66	78.95	79.44	78.25
Crude protein (total nitrogen × 6.25)	27.25	22.87	23.31	19.50	17.12	17.12	17.31
Ether extract	2.56	4.48	4.48	3.80	6.12	5.45	4.56
Fiber	12.76	13.04	17.80	13.37	17.89	18.89	20.05
Ash	7.83	6.54	7.31	7.75	8.35	7.66	8.52
Stems:							
Dry matter	....	25.84	23.66	30.21	32.63	32.84	58.90
Total nitrogen	1.95	1.76	1.88	1.59	1.65	1.60	1.46
Proteid nitrogen	1.32	1.23	1.46	1.24	1.35	1.40	1.28
Per cent proteid to total nitrogen	67.77	69.77	77.43	78.00	81.96	88.47	87.60
Crude protein (total nitrogen × 6.25)	12.18	11.00	11.75	9.94	10.31	10.00	9.13
Ether extract	1.19	.78	1.66	1.95	2.53	2.48	3.19
Fiber	50.76	48.13	46.69	48.21	48.16	48.12	55.15
Ash	6.79	5.56	5.62	5.36	6.00	4.98	4.61

About June 11, after the plants had begun to blossom, part of the leaves began to turn yellow and to fall, hence the largest proportion of leaves to stems existed just before the blossoming period. The leaves of the sample taken when the blossoms appeared contained 23.06 per cent of crude protein. On June 3 the leaves contained 63 per cent of the nitrogen in the part of the plant above ground, but by June 11 this percentage had fallen to 57. The dry matter increased quite regularly in both leaf and stem as the season progressed. In the leaf both total and proteid nitrogen decreased as the plant ripened, the proteid nitrogen decreasing more rapidly. The ether extract increased in both leaves and stems, but rather irregularly in the leaves, while the fiber increased in the leaves, but remained almost the same in the stems. The percentage of ash or mineral matter decreased in the stems, but remained almost stationary in the leaves. The results of the ash analyses of leaves and stems procured at different dates are given in tables. From these analyses it is shown that an average yield per acre of 8,000 lbs. of cured hay, which will contain about 6,880 lbs. of dry matter, removes from the soil 206 lbs. of potash, 58 pounds of phosphoric acid, 89 lbs. of lime, and 22 lbs. of magnesia. The ash of alfalfa seed contained 32.77 per cent potash and 44.29 per cent phosphate. The composition of the dry matter of the roots, blossoms, young plants, the first and second crops, and the seed is reported.

Variety tests with barley, C. Sonne (*Tidsskr. Landbr. Planteavl, 8 (1902), pp. 47–60; 9 (1902), pp. 99–114*).—The work here reported is conducted by the Royal Agricultural Society of Denmark on 5 different farms and has been in progress for 5 years. The average yield per acre for this period for the different varieties was as follows: Prentice 2,380 lbs., Chevalier 2,210 lbs., Goldthorpe 2,030 lbs., Erh. Frederiksen Hybrid 1,977 lbs., and Imperial 1,671 lbs. According to a scale of 20 points for perfection these varieties scored 14.4, 15.5, 17.9, 15.0, and 16.1 points, respectively. The results were not materially changed when the data for the season of 1901 were also included in the summaries.—F. W. WOLL.

Commercial bean growing in New York, J. L. Stone (*New York Cornell Sta. Bul. 210, pp. 231–254*).—This bulletin includes an historical account of bean culture; statistics of bean production taken from the Twelfth Census; complete directions for growing the crop, and a report on variety, fertilizer, and soil tests conducted by the station. The diseases and insect enemies of the bean plant are briefly noted.

Cooperative variety tests were conducted for 3 years. Taking the average results into account, the most productive varieties were Blue-pod medium, Marrow pea, Day leafless medium, and Boston small pea. The yields of straw in some of the variety tests were also reported. The results varied considerably in different localities. In a number of tests to determine the adaptation of the variety to the soil it was found that in general the best yields were obtained on the lighter soils. From these experiments it is concluded that there is a great difference in the productivity of the different varieties on a given soil and that the results in a variety test may not be applicable to other localities.

Fertilizer experiments were made with different combinations of commercial fertilizers and with barnyard manure. The results are reported, but are considered as not leading to satisfactory conclusions. Phosphoric acid in the form of South Carolina rock is believed to be more likely to give profitable results than any other application.

The composition of cull beans as determined by the station chemist is compared with the composition of oats, gluten feed, and corn, and the digestible nutrients in bean straw are given with those of timothy hay, corn stover, and oat straw.

Flax culture, R. KUHNERT (*Der Flachsbau. Berlin: Deut. Landw. Gesell., 1903, pp. VIII + 23*).—This book is a brief popular account of the culture and preparation of flax and the cost of its production.

Corchorus, jute, or gœni, H. J. WIGMAN (*Teysmannia, 12 (1902), No. 12, pp. 616–621*).—The author calls attention to jute culture in Java and thinks the importance of the subject warrants him in reproducing portions of a paper by J. A. B. Wiselius, published in a report of 'S Lands Plantentuin in 1886. Two species are grown for fiber, *Corchorus capsularis* and *C. olitorius*, the latter yielding the better product and being grown on low lands, while the former is better adapted to higher situations. The best lands for jute culture are those that are never under water but always moist, though much is grown on land covered with shallow water, or on land on which periodic floods leave a layer of silt.

The seeds germinate promptly and the plants are ripe in 4 months after the seed is sown. If the crop is cut too early the fiber is weak, while if the plants are allowed to bloom the fiber loses its gloss and becomes too stiff. The methods employed to separate the fiber from the rest of the plant are described. The culture of jute is said to be profitable for the small planter who does much of the work himself, but when all of the work must be paid for there is little profit.—H. M. PIETERS.

Variety tests with oats, K. HANSEN (*Tidsskr. Landbr. Planteavl, 9 (1902), pp. 203–261*).—The best yielding and most satisfactory varieties of oats tested at the different Danish plant culture stations were the Grenaa or Hessel and the Island or Förslev. The author believes these two kinds to be one and the same variety, since they correspond closely in all essential characteristics and appear to have originated in one locality, and he therefore proposes the name Danish oats for the same. On good and medium soils these oats in nearly all trials yielded about 1 cwt. more grain per töndeland (1.36 acres) than the Beseler and about 2 cwt. more than Ligowo. On light, dry, sandy soils Grey oats gave practically the same results as the Danish oats.—F. W. WOLL.

Potato culture, A. AGEE (*Pennsylvania Dept. Agr. Bul. 105, pp. 96*).—This bulletin is a popular treatise on potato culture, discussing at some length the soil and its preparation, the seed, planting, cultivation, harvesting, storing, insect enemies, diseases, and the use of potatoes for food.

Variety tests with potatoes, 1881–1898, A. J. HANSEN (*Tidsskr. Landbr. Planteavl, 8 (1902), pp. 167–189*).—Reports of 4 series of potato experiments conducted at Danish experiment stations since 1881, with summaries.—F. W. WOLL.

Spelt, emmer, and einkorn, P. HAUPTFLEISCH (*Landw. Vers. Stat., 58 (1903), No. 1–2, pp. 64–136, figs. 29*).—This article discusses the distribution and culture of these cereals; describes the different varieties under each species; presents a study of the anatomical structure of the kernels; gives the chemical composition of the grain, bran, and meal as determined by different investigators; outlines the milling processes by which bran and meal are obtained, and reports the results of a microscopical investigation of these products.

Sugar-beet experiments during 1902, F. W. Woll and R. A. Moore (*Wisconsin Sta. Rpt. 1902, pp. 241–246, fig. 1*).—Beets were grown on well-prepared rich soil. The season was very favorable and the yield obtained was at the rate of nearly 30 tons of beets per acre. The largest yield ever obtained at the station before was in 1890, when a yield of nearly 20 tons was obtained. It is believed by the author that there are few crops grown in Wisconsin that will pay better through a series of years than sugar beets. Analyses of the beets grown are given in tables.

The leaf in its relation to the sugar content of the beet, H. Plahn (*Fühling's Landw. Ztg., 52 (1903), No. 1, pp. 30–33*).—The influence of the leaf on the formation of sugar in the beet is discussed and the results of observations made along this line are reported. In the greater number of beets examined the weight of the root was from 3 to 5 times the weight of the leaves. The beets with the relatively highest weight of leaves were richest in sugar.

Fertilizing and planting sweet potatoes, M. B. Waite (*Amer. Agr., 71 (1903), No. 13, p. 359*).—The author plants sweet potatoes in drills 4 ft. apart, ridging them up after manuring and fertilizing, and setting the plants on the top of the ridges. The fertilizer is applied in the drill after laying off at the rate of about 1,000 lbs. per acre, using a mixture of 1,000 lbs. acid phosphate, 400 lbs. sulphate of potash, 100 lbs. dried blood, 100 lbs. nitrate of soda, and 400 lbs. bone tankage. The plants are set on a warm day. They are dipped first, in hands of 1 to 2 doz., into a soft mud batter about as thick as good thick cream, and set deeply.

Macaroni wheats, T. L. Lyon (*Nebraska Sta. Bul. 78, pp. 24, fig. 1*).—The appearance and habits of growth of macaroni wheats are described and the foreign and home market demands discussed, in addition to a report on cooperative culture and variety tests. About 100 tests throughout the State were made with 11 varieties obtained from Russia and Algeria. The average time of ripening for the different sorts was July 16. The date of sowing did not influence the date of ripening. The average yield of sowings made before April 1 was 19.5 bu. per acre and for those made after that date 17.5 bu. Omitting varieties with less than 5 tests, the Russian varieties averaged 21.2 bu. per acre and the Algerian 17.6 bu. From the results at hand it is concluded that durum or macaroni wheats yield better than other spring varieties. Seventeen varieties were tested at the station. The results did not indicate the variety best adapted to Nebraska conditions, but the superiority of the Russian over the Algerian sorts was shown.

HORTICULTURE.

Field experiments on the manuring of vegetable and fruit crops, F. W. E. Shrivell and B. Dyer (*London: Vinton & Co., Ltd., 1902, pp. 88*).—The experiments here recorded were made to determine the relative economy in vegetable and small fruit growing of applying manure at the rates of 12½ and 25 tons per acre alone and of supplementing the manure with varying amounts of complete commercial fertilizers or with commercial fertilizers containing but 1 or 2 of the essential elements. It was intended to learn also how far with economy commercial fertilizers can be made to take the place of manure and whether or not it is possible to dispense with manure altogether, using commercial fertilizers instead. Another phase of the question investigated was to determine the most economical amount of nitrate of soda to use with other fertilizers in manuring. The experiments for the most part have been under way for 7 years. The present report includes summaries of the results secured during the current year and of the collective results thus far secured with artichokes, Jerusalem artichokes, asparagus, beans, beets, Brussels sprouts, broccoli, cauliflowers, cabbages, carrots, celery, lettuce, onions, potatoes, peas, rhubarb, spinach, strawberries, gooseberries, and alfalfa.

The soil used for the experiments is a rather poor clay loam resting upon a bed of heavy clay. By spade culture and heavy manuring it has been converted into a fertile market-garden soil. The results obtained in the different experiments as a whole go to show that the purchase of manure for many crops is highly extravagant, as its place can well be taken by cheaper commercial fertilizers, while for many other crops manure is advantageous, but the enormous quantities often applied are altogether too costly and should be replaced in part by fertilizers in the more concentrated form. In general, the smaller amount of manure used in these experiments supplemented with commercial fertilizers has given the best results. Potash has been found especially desirable in the culture of Globe artichokes. The use of 100 lbs. of sulphate of potash per acre increased the value of the early product nearly $40.

Asparagus grown with the aid of commercial fertilizers has been more tender and of a better flavor and quality than that grown with manure alone. It is recommended that the manure and also the superphosphate and kainit for asparagus be applied in the latter part of the winter or in very early spring. On the whole, it is considered that with asparagus the best crops have been grown by using the lesser amount of manure supplemented by a dressing of phosphates, kainit, and 400 lbs. of nitrate of soda per acre.

With beets, sulphate of potash in the absence of manure increased the yield 3 tons per acre. In every case plats fertilized with the lesser amount of manure and commercial fertilizers greatly exceeded in yield the heavily manured plats.

With broccoli, a moderate application of commercial fertilizers has produced on the average as good results as when supplemented by 12½ tons of manure. With this crop the use of 100 lbs. of nitrate of soda per acre proved most economical.

The average results for 5 years with cauliflowers show that 12½ tons of manure, supplemented with a light dressing of phosphates and 400 lbs. of nitrate of soda, produced better results than commercial fertilizers alone, but the commercial fertilizers alone gave better results than 25 tons of manure alone. Commercial fertilizers in this case not only increased the size of the heads, but uniformly improved the quality. The formula recommended for this crop is 12½ tons of manure, 400 to 600 lbs. of superphosphate, 400 lbs. of kainit, and 400 lbs. of nitrate of soda per acre.

The heaviest yield of Brussels sprouts was obtained by the use of 25 tons of manure, supplemented with 200 lbs. of nitrate of soda, with potash in addition.

A moderate quantity of manure was found very desirable with fall-set cabbages. It is recommended that this be supplemented with 600 lbs. of good phosphates per acre and nitrate of soda up to 600 lbs. applied at 2 or 3 different times. For spring-set cabbages manure has not been found necessary. It is recommended that they be planted out after the removal of some other crop that has been manured, giving a liberal dressing of superphosphate and potash.

Potash has been found very desirable in the production of carrots. When potash has been used in connection with phosphates and 200 lbs. of nitrate of soda per acre, the average yearly increase of roots has been nearly 3 tons per acre.

The heaviest celery plants were obtained when the largest amount of manure was used, but plants raised with the aid of commercial fertilizers have been much crisper and more tender than plants grown with manure alone. Nitrate of soda appeared to render the growth more rapid and to diminish the strength and toughness of the fibrovascular bundles as compared with plants grown by the aid of manure alone.

With lettuce also it has been noticed that plants grown with the nitrate of soda have been much crisper and more tender than those grown with manure alone.

With spring or summer onions the use of 200 lbs. of nitrate of soda per acre, in conjunction with potash and phosphates, with a light dressing of manure, has given a better yield than with a heavy dressing of manure. Commercial fertilizers without the manure gave much less satisfactory results than with the manure.

With parsnips, as with carrots, potash seems to be especially desirable, the yields being increased from 1 to 1½ tons per acre when this fertilizer was used over plats similarly fertilized but without potash.

In the case of early potatoes the heaviest yields have been obtained by the use of 25 tons of manure per acre. With the late crop better yields have been obtained by using half this amount of manure, supplemented with commercial fertilizers. In the experiments with potatoes the use of potash has regularly resulted in increased yields. The increase, however, has been much less with early potatoes than with late potatoes.

Potash has proved especially desirable for summer spinach, and particularly so on plats which were not manured.

The use of 200 lbs. of nitrate of soda per acre with phosphates and potash for alfalfa resulted in increasing the yields on the average nearly 4 tons per acre. Nitrate of soda was also found especially desirable in the growth of dwarf beans, improving the quality and increasing the weight 80 per cent.

Rhubarb dressed with commercial fertilizers when raw was far more crisp and tender and required less time to cook than rhubarb grown by the aid of manure alone.

The flavor and keeping qualities of strawberries were also decidedly better on moderately manured plats treated with commercial fertilizers, including a moderate dressing of nitrate of soda, than on either heavily manured or heavily nitrated plats. Moderate manuring, supplemented by phosphates and 200 lbs. of nitrate of soda per acre, is recommended for this crop. The nitrate of soda should be applied early in the year. In the light of the experimental results obtained with this crop it is recommended that potash be omitted from the fertilizers applied. When this fertilizer has been used the crop has been distinctly smaller and appreciably later.

For gooseberries a moderate application of manure, supplemented with a light dressing of commercial fertilizers, is recommended.

The manuring of garden and allotment crops, P. L. de Vilmorin (*Jour. Roy. Agr. Soc. England, 63 (1902), pp. 142–163*).—A discussion of the principles involved in the use of commercial fertilizers, with the formulas recommended in France for peas, beans, potatoes, tomatoes, eggplants, cabbages, cauliflowers, radishes, lettuce, artichokes, spinach, melons, cucumbers, pumpkins, parsnips, turnips, salsify, onions, fruit trees, ornamental trees and shrubs, roses, and chrysanthemums.

Report on vegetables and plants grown at Chiswick in 1902 (*Jour. Roy. Hort. Soc. [London], 27 (1902), No. 2–3, pp. 633–665, figs. 5*).—Cultural and descriptive notes on a number of varieties of tomatoes, perennial asters, phloxes, potatoes, and miscellaneous vegetables and flowering plants grown at Chiswick in 1902.

Asparagus; its culture, yield, and future, C. Alvargonzález (*El espárrago; su cultivo, su rendimiento, su porvenir. Gijón, Spain: Mauro, 1902, pp. 24, figs. 3*).—Popular directions for the culture of asparagus.

Ginseng culture, N. O. Booth (*New York State Sta. Rpt. 1901, pp. 356–358*).—Popular directions for the culture of ginseng.

Lettuce, E. S. Brown (*Amer. Gard., 24 (1903), No. 430, pp. 183, 184*).—An account of the culture of lettuce at the American Gardening trial grounds is given, with descriptions and cultural notes on 12 varieties, and notes on the growth of endive, cress, and mustard.

Onions, E. S. Brown (*Amer. Gard., 24 (1903), No. 431, pp. 199, 200*).—An account of the culture of onions in American Gardening trial grounds, with descriptions of 6 varieties.

The artificial crossing of Victoria and Princess Royal peas, N. L. Chrestensen (*Deut. Landw. Presse, 30 (1903), No. 25, p. 213*).—The author desired to secure a pea which would ripen earlier than the Victoria, have shorter straw, and possess the productive qualities of the Princess Royal variety. These 2 varieties were therefore crossed, using each variety alternately as mother plant. In the second generation hybrids 2 distinct varieties were secured which later proved permanent in character. One of these was very similar to the Victoria in height and appearance, but ripened about 14 days earlier. This variety was also more productive than the original Victoria. The second variety secured was a medium tall growing sort about 70 cm. high and unusually productive.

The tomato, J. J. Willis (*Gard. Chron., 3. ser., 33 (1903), No. 844, p. 132*).—In order to understand the manurial requirements of the tomato, a study was made of the chemical composition of the fruit, vines, and roots. The amount of nitrogen, phosphoric acid, potash, and lime in a ton of these different parts of the tomato plant is shown in the following table:

Composition of tomatoes.

Description.	Nitrogen.	Phosphoric acid.	Potash.	Lime.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
In fruit	3.2	1.0	5.4	2.0
In vines (green)	6.4	1.4	10.0	6.7
In roots	5.4	.2	7.6	12.0
In whole plant	5.0	.9	7.7	6.9
In half ton barnyard manure	5.5	4.0	6.0	8.0

When the amount of fertilizers contained in the whole plant is compared with that contained in a half ton of barnyard manure, it is seen that the manure contains $\frac{1}{2}$ lb. more nitrogen, a little over 3 lbs. more phosphoric acid, and 1 lb. of lime more than the tomatoes. On the other hand, it contains about $1\frac{3}{4}$ lbs. of potash less than the tomatoes. The author states that it is desirable to supplement barnyard manure with potash fertilizers for tomatoes. For late crops of tomatoes a smaller amount of nitrogen is required than for the early crop and a larger percentage of phosphoric acid and potash.

The following formulas are recommended for tomatoes: (1) One part nitrate of soda, 2 parts dried blood, 4 parts superphosphate or bone meal, and 3 parts kainit; (2) 1 part nitrate of potash, 2 parts guano or dried blood, and 2 parts superphosphate or bone meal. These manures may be applied as soon as the first fruits are set. They may be dissolved and applied at the rate of half an ounce in a gallon of water once a week, or the same quantity sprinkled over a square yard of soil.

The tomato, E. J. Kyle and E. C. Green (*Texas Sta. Bul. 65, pp. 31, figs. 6*).—A popular account of the culture of tomatoes in truck gardening, with a discussion of various methods of marketing, such as consigning to commission firms, selling at the track, selling on contract, and selling on the cooperative plan.

Variations in some introduced garden vegetables, H. C. Irish (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 63, 64*).—Some of the characteristics of Mikado pepper, Chinese Giant pepper, Triumph radish, and Dwarf Willow Leaf bean are briefly pointed out.

Orchard studies—II. The fruit plantation. Stone fruits, W. B. Alwood (*Virginia Sta. Bul. 129, pp. 107–115*).—The station farm is located on a high plateau at an elevation of about 2,200 ft. and is subject to rapid changes of temperature, therefore only medium results can be reported with stone fruits. Peaches have quite generally been a failure. The plum crop has sometimes been entirely killed by frosts but occasionally full crops are secured. A list is given of 21 varieties of cherries, 54 of peaches, nectarines, and apricots, and 101 of plums that have been grown at the station, with indications as to their adaptability for culture there.

Orchard studies—III. Notes on some of the more important varieties of apples, W. B. Alwood (*Virginia Sta. Bul. 130, pp. 119–146, figs. 12*).—The unfavorable conditions of soil and climate at the station for apple culture are noted and descriptions given of 6 summer, 9 autumn, and 17 winter varieties that have been successfully grown at the station with only ordinary attention as to cultural details.

Apple shipments to the Orient, H. B. Miller (*Oregon Bd. Hort. Rpt. 1901–2, pp. 190–192*).—An account of the shipment of several varieties of apples to China. The apples were packed in boxes and wrapped in paper. The losses with the different varieties were as follows: Ben Davis, 2 per cent; Tawoer, 10 per cent; Spitzenberg, 10 per cent; Shannon Pippin, 25 per cent; Jonathan, 50 per cent, and Red Russian, 75 per cent.

The varieties of fruit that can be profitably grown in Pennsylvania, G. Hiester (*Pennsylvania Dept. Agr. Bul. 106, pp. 50, map 1*).—The author sent letters of inquiry to 3,000 fruit growers throughout the State and received answers from more than 1,000 of these, representing every county and every fruit-growing section in the State. Based on these data, directions are given for the location and culture of apples, pears, peaches, plums, grapes, and cherries in the different sections of Pennsylvania. Tables are given showing the varieties of these fruits most suitable for each section in the State and many of the varieties are briefly described. Each county of the State is taken up and its suitability for fruit growing discussed, varieties adapted for culture in the county being noted.

Thinnage of peaches, E. J. Kyle (*Texas Truck Grower, 1 (1903), No. 24, p. 1*).—Summary of the advantages derived from thinning peaches, with details as to time and methods.

Sulphured dried fruit and its examination, W. Fresenius and L. Grünhut (*Ztschr. Analyt. Chem., 42 (1903), No. 1, pp. 33–41*).—The sulphuric acid found in samples of California apricots, peaches, and pears, Italian prunes, and other dried fruits of this sort is tabulated and commented upon.

Modern fruit culture; production, commerce, and utilization of fruits, E. Durand (*La culture fruitière moderne; production, commerce et utilisation des fruits. Paris: J. B. Baillière & Son, 1902, pp. 272, figs. 28*).—A popular discussion of present-day methods in France.

Modifications in the forms of fruits; influence of the intermediate subject in top-grafting, P. Passy (*Rev. Hort. [Paris], 75 (1903), No. 5, pp. 105–108, figs. 6*).—A discussion is given, with illustrations, of the differences in the forms of pears obtained by top-grafting the Curé variety with Doyenné d'hiver and Crassane.

Modifications in the form of the pear and apple by dimorphism, P. Passy (*Rev. Hort. [Paris], 75 (1903), No. 4, pp. 85–88, figs. 2*).

Concerning root pruning, A. C. Ide (*Cultura, 14 (1902), No. 171, pp. 424–426*).—This brief paper, copied from the yearbook of the Netherland Pomological Society for 1902, records an experiment on severe root pruning of young apple and pear trees at the time of transplanting. The writer selected 1, 2, and 3 year old apple and 1, 2, and 3 year old pear trees. One-half of each lot were transplanted in the usual manner, while the others had their roots so severely pruned that only a stick was left. The trees of the first lot started off most vigorously in the spring, but before the end of June the closely pruned trees were larger than the others, and this lead was maintained throughout the season. When the trees were dug up it was found that the closely pruned ones had developed a much better root system than the others.—H. M. PIETERS.

Banana and plantain culture, T. Koschny (*Tropenpflanzer, 7 (1903), No. 3, pp. 112–124*).—The botanical relationship of these fruits, their uses, and methods of culture are discussed.

Cacao culture in the Philippines, W. S. Lyon (*Philippine Bureau Agr., Farmers' Bul. 2, pp. 25*).—Popular directions for the culture of cacao in the Philippines, including notes on climate, location, soil, planting, cultivation, pruning, harvesting, enemies and diseases, manuring, varieties, and the estimated cost and revenue derived from a cacao plantation.

Cacao; experiments in drying at Dominica (*Agr. News [Barbados], 1 (1902), No. 6, p. 85*).—By the aid of a dryer maintained at the temperature of 110 to 120° F., cacao was successfully dried within 24 hours.

Coffea stenophylla, P. VON ROMBURGH (*Teysmannia, 12 (1901), No. 12, pp. 605–610*).—The difficulties surrounding the culture of Arabian coffee have led planters to turn to several means of relief. Hybrids between the Arabian and Liberia coffees have been tried with some success and the methods of grafting the Arabian on Liberia stock have been perfected. But the author thinks there is room for improvement, and to this end suggests *Coffea stenophylla*, by some considered as a variety of *C. arabica*. *C. stenophylla* has been grown at the Buitenzorg gardens and has fruited. It gives promise of being valuable, and further trials are under way.—H. M. PIETERS.

Silkworm food plants—cultivation and propagation, G. W. OLIVER (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 34, pp. 20, pls. 13*).—Methods of propagating mulberries from seed and by cuttings, root grafts, shield budding, and by scion or sprig budding, are described and illustrated, and suggestions made regarding the soil for mulberries, planting, and pruning. The subject is treated from the standpoint of mulberries as food for silkworms. Osage orange leaves form a suitable food for silkworms when the worms are given an opportunity to select the leaves themselves, but when young and immature leaves are fed they have a tendency to sicken the worms. "Ignorance of this fact renders the use of the osage orange dangerous."

Fourth report on experiment in pinching raspberry shoots, F. CRANEFIELD (*Wisconsin Sta. Rpt. 1902, pp. 259–267, figs. 3*).—The author has investigated the value of the practice of pinching the tips of growing raspberry shoots to induce branching and fruitfulness. The earlier results obtained in this work have been previously noted (E. S. R., 13, p. 953). The following table shows the yields obtained in 1902 and the average yields for 4 years with the Gregg and Cuthbert varieties. In each experiment there were 36 plants.

Yield of raspberries on pinched and nonpinched shoots.

Treatment.	Gregg.		Cuthbert.	
	Yield, 1902.	Average of 4 seasons.	Yield, 1902.	Average of 4 seasons.
	Ounces.	*Ounces.*	*Ounces.*	*Ounces.*
Shoots not pinched	446.8	954.7	397.4	970.2
Shoots pinched at 12 in	407.5	795.1	347.7	830.5
Shoots pinched at 12 in., laterals at 12 in	1,000.9	1,118.7	408.7	857.7
Shoots not pinched	402.5	814.1	527.0	996.4
Shoots pinched at 18 in	560.6	1,150.8	419.0	864.7
Shoots pinched at 18 in., laterals at 12 in	491.8	1,046.6	415.8	908.3
Shoots not pinched	452.5	952.8	841.3	773.4
Shoots pinched at 24 in	502.5	1,261.4	750.2	992.9
Shoots pinched at 24 in., laterals at 12 in	502.8	1,182.4	658.4	773.7

This table shows that the largest average yield of the Gregg variety was obtained from the row pinched once at 24 in. Averaging the results of 4 years, for the 2 rows pinched 12 in. there was a yield of 956.9 oz., for the 2 rows pinched 18 in. a yield of 982.4 oz., and for the 2 rows pinched 24 in. a yield of 1,221.9 oz. For the 3 rows not pinched the average yield for 4 years was 907.2 oz. These results indicate that the yield of the Gregg variety has been increased by pinching. With the Cuthbert variety the 3 rows not pinched yielded an average of 913.3 oz.; the 2 rows pinched at 12 in. 844.1 oz.; the 2 rows pinched at 18 in. 886.5 oz.; and the 2 rows pinched at 24 in. 883.3 oz. Pinching with this variety appears to have decreased the yield.

An account was kept of the number of shoots and suckers produced on plants differently treated. The data presented indicate that pinching increased the production of shoots in the Gregg variety and decreased the production of suckers in the Cuthbert variety. A table is given showing the effect of pinching on the size of the berries for the 2 years 1901 and 1902. It indicates that pinching slightly increased the size of the berries with the Gregg variety while with the Cuthbert variety the size was slightly decreased. As to the effect of pinching on the form of the vines, rows pinched but once spread fully as much as those not pinched at all. Rows pinched twice were a trifle more compact.

Experiments in orchard, vineyard, and cellar, H. Schellenberg (*Jahresber. Vers. Stat. u. Schule, Wädensweil, 1899–1902, pp. 54–64*).—This report includes a test of varieties of pears, fertilizer experiment with grapes, test of American grape stocks, experiments in wine making and handling, tests of the durability of posts differently treated, etc. Of 84 posts impregnated with copper sulphate but 16 had rotted 10 years later. In another case where 97 posts were treated in a like manner but 3 had rotted at the end of 10 years. Similar results have been obtained when the posts were treated with creosote. All of the posts treated with cyanid were still in use at the end of 10 years. Training vines low and pinching off the bearing shoots 2 leaves beyond the last bunch of fruit early in the season has given better results than training high, or than training high or low later in the season and leaving on 4 leaves beyond the last bunch of grapes.

In a test of the relative merits of Steinberger and Rauenthaler pure yeasts for the fermentation of white wine, better results were obtained with the Steinberger yeast. In an experiment with red wine, fermentation was allowed to develop naturally in one portion, Assmannshäuser pure yeast was added to another portion, and Winterthurer pure yeast to another portion. Fermentation was much the most rapid when the Assmannshäuser pure yeast was used. The wine to which Winterthurer pure yeast was added stood next in rapidity of fermentation. There was also much more coloring matter in the Assmannshäuser wine than in the other 2 lots, and the taste was much more agreeable.

Pruning green grapevines, J. M. Guillon (*Rev. Vit., 19 (1903), No. 484, pp. 364–367*).—The relative merits of disbudding grapes when the young branches had attained a length of 10 cm., pinching off the shoots 2 leaves beyond the fruit bunches, pinching the extremities of the branches just before flowering, and pruning off all the branches that exceed the height of the trellis, were compared. A number of vines were left unpruned for comparison.

The untreated vines yielded at the rate of 66 kg. per 100 vines and the disbudded vines at about the same rate. Pinching the vines 2 leaves beyond the fruit as soon as the leaves attained the size of a silver dollar resulted in the development of a number of the secondary branches which had to be pruned when they had reached about the same stage of development. The more vigorous growth of vines thus developed was more difficult to manage for the control of insect pests and fungus diseases. The total weight of the harvest, however, was 92 kg. of mature grapes and 25 kg. of immature grapes per 100 vines. Pinching in this case seemed to favor the fertilization of the flowers but resulted in a rather too energetic growth. Pinching the vines at the extremities just before flowering seemed to favor fructification, since 100 vines yielded 98 kg. of good, mature grapes as compared with 66 kg. in the control plat.

Pruning the vines when they had exceeded a certain height was done at 2 different times, about July 4 and August 22. The yield obtained from vines pruned on the first day was 74 kg. per 100 vines and at the latter day 82 kg. per 100 vines.

The results here given are for 1 year only but they indicate an advantage in pruning green grapevines, more particularly pinching of the extremities of the shoots just before flowering. The experiments are to be continued.

Experiments in manuring grapes, E. Marre (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 13, pp. 388–396*).—An account of some cooperative experiments in fertilizing grapes to determine the effect on the quality of the wine. The results obtained were not uniform.

Budding the pecan, G. W. Oliver (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 30, pp. 18, pls. 8*).—Methods of successfully budding and transplanting budded pecan trees are given, together with a number of drawings illustrating the various phases of the subject. The principal trouble arising from budding pecans seems to be due to the selection of immature buds. The author prefers for planting nuts obtained from the northern borders of the pecan belt since these are likely to be more hardy than those grown farther south. Over winter they should be layered in boxes filled in alternate layers with a mixture of sand and ashes. Rows in spring are planted east and west so that the trees may be budded on the north side. In planting trenches are made about 3 ft. apart and 5 in. deep. The bottoms of these are covered about 2 in. deep with a mixture of equal parts leaf mold and sand. The nuts are spaced 5 in. apart and the soil raked over them. Above the rows a half-inch mulch of half rotted leaves, cut cornstalks, or other materials is placed to prevent the soil from baking. The buds selected for propagation should be those formed during the preceding season. These dormant buds are easily removed from the bud stick and can be handled without injury. After union and the cutting back of the stocks these buds make a much stronger growth during the remainder of the season than would buds of the current season's growth. The best buds are obtained from near the base of the shoots which grew from axillary buds the preceding season. As soon as the bud stick is cut from the tree the current season's growth is cut off and discarded and the 1-year-old bud sticks wrapped in dampened newspapers. In this manner they can be kept for several days if necessary.

In budding 2 transverse cuts, a few inches above the ground line, are made about an inch apart. These are connected by a longitudinal cut through the center. The bark on either side of this longitudinal cut is raised to admit the bud. The bud is cut exactly the same length, about 1 in. long and $\frac{5}{8}$ in. wide, with the bud in the center. Considerable care is necessary in raising the patch from the bud stick to prevent breaking the bark and otherwise injuring it. The outer bark of the bud patch is shaved off a little so that the edges will make a perfect fit under the bark of the stock. After the bud has been placed securely in position the bark of the stock is bound firmly over it and held in place with raffia. A little soft grafting wax is smeared across the top of the cut to prevent the admission of water, and the whole patch except the bud wrapped with a narrow strip of waxed cloth. The wrapping is begun at the bottom and each wrap half covered by the succeeding one. As a protection against the sun a strip of paper about 8 in. long and 6 in. wide is tied about an inch above the bud. The paper extends downward and covers the bud but is left open at the bottom. After the sixth day the paper covering is removed and after the tenth day the wax cloth taken off. By the end of the fifteenth day the buds will have united sufficiently to permit of the removal of the raffia.

This method of budding is stated to make a very satisfactory union. With carefully selected buds from 1-year-old wood and vigorous growing seedling stocks, practically every section of the bark will unite.

When the seedling stocks are small a triangular bud patch may be used. Great care must be taken that the patch exactly fit the patch of bark removed from the stock. One apex of the triangle should point upward. A small quantity of soft grafting wax should be smeared over the cut before it is tied with raffia. This method of budding is especially useful with small buds; with the large buds a larger section of bark is needed.

Buds should be encouraged to start promptly into growth. This is facilitated by removing the top of the seedling, leaving only 1 or 2 healthy leaves at the base of the present season's growth. The buds in the axils of the leaves which start out within a few days should be promptly removed. Within a month the scion bud will have developed several full sized leaves. If the buds are inserted before the end of June there will be abundant time for the development of a good sized shoot. The practice of tying the scion to the stock is recommended. At the beginning of the second season all of the stock above the scion should be smoothly cut off and covered with melted grafting wax to prevent decay.

Transplanting with budded stock should not be attempted until the third year on account of the danger involved in interfering with the growth of the tap root of the tree. If budding is practiced when the seedling is 2 years old the tree should remain unmoved until the end of the growing season the following year. In removing the tree the retention of the roots for at least 2½ ft. below the surface of the soil is desirable. As soon as the roots are removed from the soil they should be dipped in liquid mud, after which they should be promptly wrapped in damp sacking, moss, or other like material, and kept in a moist condition until planting time. Before planting they should be again plunged in liquid mud. Excessive trimming of either the branches or the roots of the tree at transplanting time should be avoided. At least one healthy undisturbed shoot of the previous season must be left on the plant untouched "because the large plump axillary buds near the tip of the shoot will come into leaf with greater certainty and more quickly than will older buds on cut-back growths."

Experiments with manures for chrysanthemums, G. TRUFFAUT (*Jour. Soc. Nat. Hort. France, 4. ser., 3 (1902), Dec., pp. 822–832, figs. 5; abs. in Gard. Chron., 3. ser., 33 (1903), No. 848, p. 200; Amer. Florist, 20 (1903), No. 775, pp. 418–420*).—An account is given of the results of pot experiments in the culture of chrysanthemums in 10 different localities in France with various combinations of fertilizers. In every instance the soil used was analyzed before the experiment began. The results of these analyses, together with the growth of the plants on the soils when differently fertilized, are reported in detail.

The variety Madame Gustav Henry was generally grown. The plants were trained, some to 3 branches, some to 6 branches, and some were not disbudded at all. Four plants were used in each instance as controls, 4 received a complete fertilizer, 4 a double quantity of complete fertilizer, 4 a complete fertilizer without nitrogen, 4 a complete fertilizer without potash, and 4 a complete fertilizer without phosphoric acid. At the time of potting the various fertilizers were thoroughly mixed with the soil. They consisted of 25 per cent fish guano, 16 per cent dried blood, 24 per cent sulphate of potash, and 35 per cent double superphosphate. This mixture analyzed 45 per cent nitrogen, 11 to 12 per cent potash, and 15 to 16 per cent phosphoric acid. Later in the season a solution of fertilizer was used for watering the plants made up of 54 per cent phosphate of potash and 46 per cent nitrate of soda, analyzing 6.9 per cent nitrogen, 14.04 per cent potash, and 20.52 per cent phosphoric acid. The fertilizers mixed with the soil were used in the proportion of 900 gm. to 100 kg. of soil. In the solutions 2 gm. per liter was used.

In the fall of 1902 each of the cultivators presented at a meeting of the horticultural society a specimen plant representing the average of the results obtained in each experiment. One of the experimenters had employed white sterile sand for the experiment in growing the plants, the object being to study the specific effect of each of the essential fertilizer elements. The object sought by remaining experimenters was to study the influence of the complete and supplementary fertilizers in soils of known composition and also the influence of climate on the action of fertilizers and the culture of the same variety.

The best results secured when sterile white sand was used were with a complete fertilizer. Plants without potash stood next, then those without nitrogen, while the poorest result of all was obtained when phosphoric acid was omitted. The plants without phosphoric acid were chlorotic, and had weak stems and small flowers. When potash was omitted from the complete fertilizer the plants had a weak habit, the leaves were large, thick, and green, but soft and easily fell from the plant. The stems were large and hollow and the flowers large but of bad form. When nitrogen was omitted from the complete fertilizer the plants were yellowish, the leaves thick and small, the stems weak, and the flowers few in number, small, and hollow at the center.

The results secured with good potting soils in the other experiments on the whole indicate that a potting soil for chrysanthemums should contain 2½ gm. of nitrogen, 1½ gm. of phosphoric acid, and 1¼ gm. of potash per kilogram. For the out-door culture of chrysanthemums it is suggested that the chrysanthemum soil contain at least 1½ gm. of nitrogen, 1 gm. of potash, and 1 gm. of phosphoric acid per kilogram. In practice it is advised that a soil for chrysanthemums be made up of 2 parts of good sandy loam and 1 part of leaf mold. These should be thoroughly mixed and a sample sent to a chemist for analysis. With a knowledge of the elements that a chrysanthemum soil should contain the fertilizers to be added can be easily determined. An excess of nitrogen in the soil favors the development of diseases. Should this element be lacking it may be added in the form of dried blood, horn, or guano. Potash is best added in the form of sulphate of potash and phosphoric acid in the form of superphosphate of bone or of precipitated phosphate. With the chrysanthemums grown in pots it is extremely desirable that soluble manures be added, beginning about August 15.

The effect of climate on the different plants is shown quite clearly. There was a difference of about 3 weeks in the development of the plants between Lille and Avignon. The fertilizers also appeared to be more effective in the north of France than in the south.

Conference on roses at the Holland House (*Jour. Roy. Hort. Soc.* [*London*], *27* (*1902*), *No. 2-3, pp. 445-563, figs. 34*).—At this conference, which was held in London, June 24 and 25, 1902, the following papers were presented: A Synoptic Table of the Sections of the Genus Rosa According to the Classification of M. Crépin, by J. Gérome; Rose Forcing in America, by Anne Dorrance; Some Wild Asiatic Roses, by M. L. de Vilmorin; New Hybrids to Aim at, by Viviand-Morel; On Different Ways of Striking Roses, by Viviand-Morel; Sensitiveness of Cultivated Roses to Changes of Weather, by E. Mawley; The Hybrid Tea, by J. H. Pemberton; Exhibition Roses, by G. Paul, etc.

Mendel's principles applied to orchid hybrids, C. C. HURST (*Jour. Roy. Hort. Soc.* [*London*], *27* (*1902*), *No. 2-3, pp. 614-624, figs. 3*).—The hybrid orchid *Paphiopedilum* × *Leeanum*, obtained by crossing the 2 species *Paphiopedilum spicerianum* and *P. insigne*, was crossed with *P. boxallii* with the idea of testing Mendel's theory as to the purity of the single character determinants in the germ cells of hybrids. During the past 4 years 49 hybrids thus obtained have flowered. There was an extremely wide variation in the form and color of the different hybrids, no two of the flowers obtained being alike, and the extreme forms were very distinct. If the species *P. spicerianum* be represented by S, *P. insigne* by I, *Paphiopedilum* × *Leeanum* by SI, *Paphiopedilum boxallii* by B, progeny of the crosses of the two latter, according to Mendel's theory, must come out for any single character, either BS or BI, but not BSI. This is exactly what happened. The dorsal sepal of the hybrid was selected as the single character for investigation and examined with respect to (1) ground color, (2) markings on ground color, and (3) median band, the average for these 3 factors being 76 BS and 71 BI, which is a fair approximation to the equality which Mendel's theory presumes. It is therefore believed that as far as these experiments go "they confirm Mendel's theory of the purity of the determinants in the germ cells of hybrids . . . and for all practical purposes Mendel's principles may be safely accepted as a working formula for the hybridist in general, and the orchid hybridist in particular." Illustrations are given of 32 of the hybrids which happened to flower together.

The book of the wild garden, S. W. FITZHERBERT (*London and New York: John Lane, 1903, pp. 96, pls. 9*).—Cultural and descriptive notes on hardy plants for outdoor garden culture. This book is the thirteenth of the series of Handbooks of Practical Gardening, edited by H. Roberts.

A new design of greenhouse (*Amer. Agr., 71 (1903), No. 14, p. 391, figs. 2*).—One of the peculiarities of this greenhouse is the curved eave line. There is no eave plate and no gutter. Illustrations are given of the interior and exterior of the house, which was built at Briarcliff, New York, in 1901.

Horticulture in Egypt, L. SAUNDERS (*Jour. Roy. Hort. Soc. [London], 27 (1902), No. 2-3, pp. 629-632*).—An account of recent development along horticultural lines in Egypt.

FORESTRY.

The principal species of wood, their characteristic properties, C. H. SNOW (*New York: John Wiley & Sons, 1903, pp. XVI + 203, pls. 39, figs. 20*).—This book, which, as the author says, is not designed primarily for foresters, botanists, or engineers, but for all the users of wood who desire knowledge regarding their distinguishing properties, gives in untechnical terms the principal features which characterize the economically important species of wood. The necessary terms used are first defined, after which the structure, methods of growth, and appearance in different sections of woods are described. The differences in wood that distinguish the greater subdivisions are pointed out, after which the species are described under appropriate groupings. In many cases the species are grouped under their generic names, or a number of nearly related forms are brought together. The distribution, structural and physical properties, commercial features, and botanical characteristics are first described for the genera, after which the leading species are considered in detail. Of the more than 120 species of timber described, most of them are indigenous to the United States, although a few of the more important exotic species are included. The illustrations, which are a highly commendable feature of the work, show the general aspect of the tree and a large section of the trunk, the grain characteristics of the wood, and in many instances the leaf and fruit in detail. Of the 155 figures that go to make up the plates nearly all are original, and reproduction is well done. The publishers have presented the work in an attractive form, and this book will doubtless be found useful for students as supplementing the technical works on botany and forestry, as well as giving desired specific information regarding our more important timber trees.

Applied ecology, B. E. FERNOW (*Science, n. ser., 17 (1903), No. 433, pp. 605-607*).—After giving the definition of ecology the author proceeds to discuss it from its silvicultural relations. This is done in the hope of stimulating observations which will aid in solving some of the perplexing problems of the practical forester. According to the author, the silvicultural factors may be divided into 2 classes, those which are stable and the variable ones. The stable factors are soil and general or local climate, while the unstable ones are seasonal variations, plant and animal associates, and light. These different factors are discussed at some length and the hope expressed that others will take up and pursue the subject, particularly that relative to light and shade.

A study of the redwood, R. T. FISHER (*U. S. Dept. Agr., Bureau of Forestry Bul. 38, pp. 1-28, pls. 9, dgms. 2*).—This study is made more with reference to the young, second-growth redwood than to the mature trees. The author claims that redwood reproduces itself abundantly by sprouts on cut-over land and occasionally by seed; that in 30 years in a fair soil and a dense stand it will produce trees 16 in. in diameter and 80 ft. high, yielding 2,000 ft. B. M. per acre. On account of this rapid reproduction, after careful lumbering it will pay to hold cut-over redwood lands for future crops.

The redwood described is *Sequoia sempervirens*. Its distribution through California and into Oregon is indicated, and the climatic conditions required by the tree are shown. Two types of redwood forest are described, the redwood slope and redwood flats. The characteristics of the timber, the quality of its wood, reproduction, associated species, and enemies are described. The yield of redwood is shown to range from 20,000 or 30,000 to 125,000 to 150,000 ft. B. M. per acre, depending on the locality. The amount of timber gotten out, however, is a small proportion of the actual stand, as at least one-fourth is destroyed in the ordinary processes of lumbering. A history is given of the lumbering of the redwood. Its extent and present operations and the results of studies of cut-over lands are shown, in which the rate of growth and merchantable yield are given. The conservative management of redwood forests, as indicated by the report of a company operating in that region, shows that the redwood can be readily handled as a permanent investment if sufficient seed trees be left and the protection given against fire and other injuries.

Report of the superintendent of State forests, W. F. Fox (*New York State Forest, Fish, and Game Com. Rpt. 1902, pp. 11–67, pls. 20, maps 2*).—A detailed report is given of the forestry work conducted under the direction of the commission during the year 1902. Special mention is made of the subject of fire protection. During the year covered by the report it is stated that while 21,356 acres were burned over in New York, more than three-fourths of this was waste land on which there was no merchantable timber. Attention is again called to the restriction limiting the work of the forester to reforestation through planting, etc., no provision being made for improvement cuttings. Forest nurseries have been established for the production of seedlings for future plantings, and a detailed report is given of the planting operations conducted during the year. The total area in the Adirondack and Catskill forest reserves is said to be 1,408,181 acres, to which there were added during 1902, by purchase and tax sales, 28,505 acres, making the total State forest reserves 1,436,686 acres. The private preserves within the State, a list of which is given, contain 791,208 acres of forest land. An attempt was made to collect statistics regarding the timber output of the State, and it is said that the total output of the Adirondack and Catskill forests amounted to 659,382,520 ft. B. M., with 38,148,250 shingles and 56,396,000 laths additional.

A report on dead and diseased trees on Long Island, A. Knechtel (*New York State Forest, Fish, and Game Com. Rpt. 1902, pp. 67–76, pl . 2*).—At the direction of the forester, the author visited Flushing and Port Jefferson to ascertain the cause of the death of numerous shade trees in those towns. The shade trees of Flushing are noted for their beauty, size, and variety, and as a large number of trees died during the years 1901 and 1902 the investigation was undertaken at the request of the citizens at that place. An examination of many of the trees showed them to bear evidence of insect attacks, particularly that of the white-marked tussock moth. In addition many trees were found in which the evidence seemed strong that their death was due to the escaping of gas. Suggestions are given for the care of street trees and recommendations made for the prevention of future losses. At Port Jefferson specimens of pitch pine occurring in a park were found dead and dying, and an examination showed that the trees were badly attacked by fungi, which had gained entrance through improper pruning. Others had died from crowding and too much shade, and the thinning of the trees was recommended as a protective measure.

Gathering spruce seed, C. R. Pettis (*New York State Forest, Fish, and Game Com. Rpt. 1902, pp. 76–87, pls. 3*).—In order to supply seed of the native red spruce for the State nurseries the author undertook gathering the seed in considerable quantity. The methods adopted are described in detail, and it was found that the seed could be collected in considerable quantity at a saving of about 50 per cent of the market price.

Report of the Maine Forest Commissioner, 1902, E. E. Ring (*Maine State Forest Comr. Rpt. 1902, pp. 1–61, pls. 12*).—This report contains an account of investigations relating to the stand of merchantable spruce timber within the State, a summary of which has already been given (E. S. R., 14, p. 872). A discussion is given of some of the enemies of the forest in which the destruction caused by fire, winds, wasteful cutting, etc., is described. A brief résumé is given of forestry principles and practices of the United States and a number of foreign countries, together with the act of the legislature creating a bureau of forestry in Maine. Various conclusions are drawn from the investigations of the author, and recommendations regarding future lines of work are made.

A study of the Maine spruce, R. S. HOSMER (*Maine State Forest Comr. Rpt. 1902, pp. 65–108, pls. 13, map 1*).—This work was carried on in connection with the Bureau of Forestry of this Department, and a report is given of the spruce timber as observed from a survey made in one of the counties of that State. The situation, topography, and soils of the tract surveyed are described, and the forest is considered under different types of swamp, flats, slopes, etc. The method of reproduction of the spruce is described at some length and estimates made regarding the present stand, rate of growth, and future yield. Associated with the spruce are various hard woods, and suggestions are given for the lumbering of these as well as of the spruce. A list is appended of the trees and shrubs observed associated in the spruce forests. The conclusions of the author relating to the handling of these spruce forests are summarized and the author believes that practical forestry may be advantageously introduced to supply continually the demands of pulp and sawmills. For this purpose working plans will be needed for different regions. In conservative lumbering the author believes that cuttings should be limited to trees of considerable diameter. This will leave the forest in better condition after lumbering than when a smaller limit is used, but the diameter limit will be found subject to modification as a result of the character of the forests and the requirements of the owners. The hard woods should be lumbered wherever possible, both on account of their present value and the improvement to the forest caused by their removal.

Distribution of plants in forest regions, W. M. MUNSON (*Maine State Forest Comr. Rpt. 1902, pp. 111–124, pls. 4*).—Some of the methods of seed distribution are described, and the distribution as affected by modifications of fruits and seeds is shown. The effect of winds, water, birds, and other animals as agents in seed distribution is indicated, and the limitations of time and environment in the production of forest species are shown. It is said that a natural succession of forests is due to changed natural conditions, and the succession may be rapid as when an area is swept by fire, or it may be the result of gradual encroachment of more dominant species.

Management of pulp wood forests, A. CARY (*Maine State Forest Comr. Rpt. 1902, pp. 125–144, pls. 12*).—An account is given of the management of the pulp wood forests by the Berlin Mills Company, and notes are given on some of the insect and fungus pests which threaten the destruction of the spruce timber. The principal injury is due to the bark beetle (*Dendroctonus piceaperda*). The habits of the insect are described and practical remedies suggested for preventing its ravages. Notes are also given on other insects as well as on the fungus *Polyporus volvatus*, which is frequently found growing out of spruce bark.

The regeneration of woods from seed naturally or artificially sown, A. C. FORBES (*Trans. English Arbor. Soc., 5 (1902–3), pt. 2, pp. 239–270, pls. 2*).—The author discusses the natural regeneration of forests and their formation from seed sown either naturally or artificially, as distinguished from plantations made from nursery-grown trees. The comparative advantages of sowing and planting are contrasted and the species adapted to sowing are indicated. Among the conditions necessary for successful natural regeneration of deciduous species the author claims that there should be present sufficient seed-bearing trees, the surface soil should be clean and porous, with an absence of large quantities of raw humus, the seed should be covered by the soil, the seedlings should be protected from injury, and there should be a timely removal of the old crop of seed-bearing trees. The influence of each of these factors on forest production is discussed at considerable length. The treatment required by the regenerated areas is described, and typical examples of natural regeneration of oak, ash, and beech are cited. The regeneration of Scotch fir, raising plantations from seed, recurrence of seed years, means for collecting seed, and cost of sowing plantations are all discussed.

The natural regeneration of oak and beech woods, L. S. WOOD (*Trans. English Arbor. Soc., 5 (1902–3), pt. 2, pp. 278–290*).—The relative merits of the selection and crop rotation systems applied to oak and beech woods in England are discussed.

The management of public and private parks, J. WILSON (*Trans. English Arbor. Soc., 5 (1902–3), pt. 2, pp. 271–277*).—A discussion is given of the principles of planting and managing public and private parks.

Sawmills and wood-working machinery for estates, J. PRICE (*Trans. English Arbor. Soc., 5 (1902–3), pt. 2, pp. 291–306*).—A discussion is given of the general subject of the establishment of mills and motive power, and descriptions are given of different kinds of saws and other wood-working machinery.

Reclaiming and planting bog land, T. CONWAY (*Trans. English Arbor. Soc., 5 (1902–3), pt. 2, pp. 307–315*).—A description is given of various types of bog lands, and suggestions are given for their draining and planting, together with a list of the most suitable varieties of trees to plant. In planting bogs it is considered of advantage to prepare the soil while draining by composting as much as possible upon it the leaves, weeds, grass, and other material, as well as the addition of clay and lime, the latter to reduce the acidity of the soil. Where peat is present this should be burned, or if not burned the soil should be fallowed for at least 2 years. In planting, the most suitable trees for preliminary planting are said to be willows, Scotch pine, and spruces. The best time for planting bogs is in the early spring. Trees planted in the autumn in such wet soils generally perish. When the total area is prepared for planting, the trees may be selected from the list given, which includes alders, birches, Scotch pine, willows, poplars, spruces, and larch.

Revenue from the forest of Compiègne for 1900 (*Trans. English Arbor. Soc., 5 (1902–3), pt. 2, p. 229*).—A tabular report is given showing the annual receipts and expenditures of the forest of Compiègne, in which the gross revenue amounted to $189,218 and the total expenditures to $31,453, leaving a net revenue of $157,765 for the forest of 36,072 acres, or about $4.50 per acre.

Trees on the farm, H. PYE (*Jour. Dept. Agr. Victoria, 1 (1902), No. 9, pp. 847–852*).—Attention is called to the desirability of tree planting, both as wind-breaks and for timber. The methods of planting and cultivation are described and lists given of trees which by their growth have shown that they are adapted to the conditions in the region for which the report is prepared.

SEEDS—WEEDS.

The acquisition of the germinative faculty in ripening seed, P. MAZÉ (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 24, pp. 1130–1132*).—The author states that many experiments have been conducted to ascertain the time at which ripening grains attain their ability to germinate, the results obtained being more or less contradictory. He gives the results of his experiments with peas and maize, which were taken from the pod or ear at the time the seed was in the milk and placed immediately one by one in test tubes furnished with 2 plugs of cotton, one of which served to support the seed at the surface of the distilled water and the other intercepted the entrance of micro-organisms. Under these conditions the seed were kept for a considerable time at a temperature of 30° C. The maize finally gave normal plants which developed vigorously, while the seedlings of the peas were distorted and in many cases the shoot was unable to break through the seed coats. In other cases the peas failed entirely to germinate. If the seed was dried in contact with the air or over concentrated sulphuric acid it was found that they would germinate more promptly and the seedlings be more nearly normal. The experiments with maize are described with considerable detail. Two rows of grain were detached from the ear, the first consisting of 20 grains placed to germinate immediately, while the second was dried for 48 hours over concentrated sulphuric acid, after which they were placed to germinate. The first lot germinated 20 seed in 30 days, while the second lot, which consisted of 19 seed, all germinated in 2 days.

In the second experiment with maize 3 lots of seed were removed from the ear while the grains were still in the milk stage. The first lot, consisting of 20 grains, was placed to germinate immediately. The second was exposed for 8 days in the laboratory, losing in this time a considerable portion of their water. The third lot was dried for 8 days over a weak sulphuric acid, after which it was placed to germinate. Of the first lot of seed but 2 germinated in 34 days, of the second lot 20 seed germinated in 14 days, while of the third, which consisted of 15 grains, all germinated in 3 days.

The influence of formaldehyde on the germination of oats, F. CRANEFIELD (*Wisconsin Sta. Rpt. 1902, pp. 268–272*).—In the previous report of the station an account was given of the influence of formaldehyde on the germination of oats. In the present report further studies are given showing the influence of this fungicide on the viability of seed, in which stronger solutions were used and varying periods of time employed. It was found that soaking the seed in a solution of 2½ parts of formaldehyde and 1,000 parts of water injured the seed oats from 6.4 to 17.4 per cent. Where stronger solutions were used the injury was increased in direct proportion. These tests were conducted under ordinary field conditions. In spite of the injury, the successful use of this fungicide for the prevention of oat smut, the author believes, warrants its continued use.

The effect of depth of planting on the germination of clover seed, F. CRANEFIELD (*Wisconsin Sta. Rpt. 1902, pp. 273–279, figs. 2*).—The results of a number of trials in planting clover seed at different depths are given, the germination of the seed being noted at the end of 5, 10, and 20 day periods. The different lots of seed were planted to depths of ⅛ in., ¼ in., ½ in., ¾ in., 1 in., and 2 in. The experiments described involved the planting of about 45,000 seed, and the results obtained show that planting between ¼ and ¾ in. was the most favorable for rapid germination and produced the highest percentage of germination. When the seed were covered to a depth of 1 in. less than half germinated and when covered with 2 in. of compacted soil less than ⅕ germinated.

The effect of sunlight upon the germinative power of seed, E. LAURENT (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 26, pp. 1295–1298*).—On account of the injurious action that sunlight is known to exert upon bacteria, yeasts, spores of certain fungi, etc., the author conducted experiments to ascertain its effect upon the germinative ability of certain seeds. Seeds of wheat, rye, black and white mustard, cress, clover, dandelion, *Hieracium* spp., sow thistle, and groundsel were placed in tubes in series and exposed to the direct sunlight during a period of prolonged and intense sunshine. They were afterwards placed to germinate, and it was shown that the sunlight had exerted a detrimental effect upon them which in some cases entirely destroyed the embryos of the seed. In general, the larger seeds, such as rye, wheat, and those having white seed coats, as the white mustard, were less injured by the solar radiation than the small seed or those provided with dark-colored seed coats.

Experiments on the germination of seed preserved in a vacuum, E. LAURENT (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 24, pp. 1091–1094*).—In 1894 the author placed the seeds of a large number of field and garden plants of the crops of 1892, 1893, and 1894 in test tubes, and so arranged them as to permit of the liberation of carbon dioxid given off by the seed. These were examined for their germination after 2½ years, 5 years, and 7 years 4 months. The germinations secured in the different trials are reported upon. Those tested after the 5 years' interval showed that the following seed germinated well in the vacuum: Spinach, colza, cabbage, turnips, white and black mustard, cress, lupine, clover, beans, corn salad, and squash, while wheat, rye, barley, oats, maize, buckwheat, spurry, and poppy were decidedly injured by the treatment. Seeds of garlic, cumin, and chervil were killed. Similar results were obtained in the test conducted 7 years and 4 months after sealing up the seed. In general the results show that oil-bearing seed are better preserved in a vacuum than in contact with the air. Among the starchy seeds the ones which best withstood the prolonged deprivation of air were spinach, corn salad, clover, lupine, and beans, while wheat, rye, barley, oats, maize, and buckwheat were rapidly destroyed by such treatment. The author attributes the depreciation of oil-bearing seed to the rapid alteration of the fatty bodies in the presence of oxygen.

Red clover seed and its impurities, D. FINLAYSON (*Aynsome Agr. Sta., Grange-over-Sands, Cent. Seed-Testing Lab. Farmers' Bul. 1, pp. 8, pl. 1*).—Attention is drawn to some of the impurities found in red clover seed and directions given for sampling and for determining the purity and germination of clover seed. The author distinguishes between the red clover, which he calls *Trifolium pratense*, and the perennial red clover, to which the name *Trifolium pratense perenne* is given.

Notes on weeds, T. W. KIRK (*New Zealand Dept. Agr. Rpt. 1902, pp. 373–380, figs. 3*).—Notes are given on a number of noxious weeds and suggestions for their eradication. Particular attention is given to the ragweed (*Senecio jacobeus*) and the ox tongue (*Picris echioides*).

DISEASES OF PLANTS.

Plant depredations and plant culture, F. W. RANE (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 160–164*).—The author attempts to emphasize the relation which exists between host plants and their parasites and points out a condition which influences to a greater or less extent their relationship. He argues for the better care of the host plant, neglect and improper handling being accompanied by weakened plants which are more subject to insect and fungus attack.

The æcidium as a device to restore vigor to the fungus, J. C. ARTHUR (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 65–69*).—The author discusses the wintering forms of a number of rust fungi and the possible effect of their habit on the vigor of the parasite. So far as known *Puccinia rubigo-vera* produces only uredospores in North America, and on this account it is believed that this rust is less destructive than the black rust or *P. graminis*. A second illustration studied was that of *P. poarum*. This rust forms only uredospores in North America and is widely distributed, but produces so little effect upon its host as to be almost always overlooked. In Europe it produces 3 forms of spores, but some of the alternate hosts are wanting in this country. The author discusses the relation of *P. graminis* to wheat and barberry, and believes that if all the barberry plants could be totally destroyed the stem rust would ultimately become much less harmful than at present.

A contribution to the knowledge of rust fungi, E. JACKY (*Centbl. Bakt. u. Par., 2. Abt., 9 (1902), Nos. 21, pp. 796–805; 22–23, pp. 841–844*).—The results of a series of culture experiments running over the years 1899–1902 are given, in which the author claims that *Puccinia bardanæ* is specialized on *Lappa* spp. and *Puccinia cirsii* on *Cirsium* spp. *Puccinia violæ* is said to be autœcious on *Viola* spp., *Puccinia helianthi* autœcious on *Helianthus* spp., and *Puccinia prenanthis* specialized on *Prenanthes purpurea* and *Lactuca muralis*.

Inoculation experiments with some Uredineæ, F. BUBAK (*Centbl. Bakt. u. Par., 2. Abt., 9 (1902), No. 25, pp. 913–928, figs. 3*).—The results are given of inoculation experiments with *Puccinia balsamitæ*, *Æcidium thymi*, the æcidial form of *Puccinia stipæ; Endophyllum sedi*, a form of *Puccinia longissima; Æcidium lactucinum*, which is associated with *Puccinia opizii; Uromyces scirpi*, and *U. poæ*.

Culture methods with Uredineæ, M. A. Carleton (*Jour. Appl. Micros. and Lab. Methods, 6 (1903), No. 1, pp. 2109–2114*).—Suggestions are given of methods for the cultivation of various Uredineæ, the methods of germination and inoculation being described and a number of suggestive studies being indicated.

Some injurious fungi occurring on cultivated plants in Dutch East Africa, P. Hennings (*Notizbl. K. Bot. Garten u. Mus., Berlin, 3 (1903), No. 30, pp. 239–243*).—Descriptions are given of a number of new species of fungi which are found occurring parasitically on economic plants. Among those described are *Asterina stuhlmanni* on bananas; *Microthyrium coffeæ* on coffee; *Mycosphærella tamarindi* and *Glœosporium tamarindi* on tamarind; *Macrophoma manihotis*, *Ascochyta manihotis*, and *Glœosporium manihotis* on cassava; *Trullula vanillæ* on vanilla, and *Helminthosporium tritici* on wheat.

Two new fungi from Ohio, F. Bubak (*Jour. Mycol., 9 (1903), No. 65, pp. 1–3*).—Descriptions are given of *Stamnaria* sp., which is parasitic on species of Equisetum, and on *Cercospora kellermani*, which occurs on hollyhock.

Concerning the name and distribution of Urophlyctis bohemica, P. Magnus (*Centbl. Bakt. u. Par., 2. Abt., 9 (1902), No. 24, pp. 895–897*).—The author discusses the identity of *Synchytrium trifolii* described by Passerini as occurring on the leaves of the common red clover and *Urophlyctis bohemica*, recently described by Bubak as parasitic on *Trifolium montanum*. Recent studies have shown that the species formerly referred to Synchytrium is a Urophlyctis, and the author believes the 2 species are identical, the proper name of the fungus being *U. trifolii*. The species seems to be widely distributed throughout Europe, where it occurs as a parasite on various cultures.

A contribution to the micology of Liguria, A. Magnaghi (*Separate from Atti Inst. Bot. Univ. Pavia, 2. ser., 8 (1902), pp. 13*).—Lists are given of some parasitic fungi, a number of which are of considerable economic importance. New species are described as follows: *Macrophoma ligusticum* on hydrangeas, *M. helicinum* on ivy, *Cytosporella citri* on orange, *Sphæropsis magnoliæ* on magnolias, *Glœosporium begoniæ* on begonias, and *Colletotrichum pollaccii* on Japanese loquat.

The development of a new parasitic micromycete, R. Farneti (*Separate from Atti Inst. Bot. Univ. Pavia, 2. ser., 7 (1901), pp. 42, pls. 4*).—A description is given of a new parasite of Salvia to which the name *Oidium hormini* is given. The development and polymorphic phases of the organism, as shown by numerous culture experiments, are fully described.

Notes on two diseases of cotton, F. Fletcher (*Jour. Khediv. Agr. Soc. and School Agr., 4 (1902), No. 6, pp. 238–241*).—In continuation of a previous report on the wilt disease of cotton (E. S. R., 14, p. 579), the author states that what is known in this country as sore shin, damping off, or seedling rot is responsible for a considerable portion of the loss of cotton in Egypt. In addition to this disease the cotton wilt, due to *Neocosmospora vasinfecta*, is quite prevalent, causing considerable loss, but the disease is apparently not as injurious as is reported in this country. This is believed to be due to the resistance of some Egyptian varieties to this fungus. Among the varieties in general cultivation Abbasi seems to suffer most from the wilt, and Mitafifi and Yannovitch the least. The author shows that a number of other plants are subject to attack of the wilt fungus and in arranging rotation of crops these should be carefully excluded.

Experiments with rust-resisting wheats, W. L. Summers (*Jour. Agr. and Ind., South Australia, 6 (1903), No. 7, pp. 449–455*).—A report is given of cooperative experiments with 16 varieties of rust-resistant wheats, the trials being made in 9 different localities. In 1901 the crops suffered severely from rust, but during the year covered by this report the rust did not prevail to any extent and little comparison could be made between the different varieties as to their resistance. The origin of the different varieties of wheat is given, and their relative yields and character of grain and straw compared.

Concerning the so-called brusone of wheat, V. PEGLION (*Staz. Sper. Agr. Ital., 35 (1902), No. 11–12, pp. 865–886*).—Under the name brusone the author describes the disease of wheat that has been attributed to the fungi *Leptosphæria herpotrichoides* and *Ophiobolus graminis*. This disease, which is commonly called the foot disease, the author apparently believes is due at times to soil conditions, and he discusses the effect of alkali and other soils on the growth and development of the plant.

Studies on the germination of ergot, S. J. ROSTOWZEW (*Ber. Moskau. Landw. Inst., 1902, No. 3; abs. in Bot. Centbl., 90 (1902), No. 25, pp. 705, 706*).—The results of studies of *Claviceps purpurea* and *C. microcephala* are given.

Seed treatment for the prevention of millet smuts, L. HECKE (*Ztschr. Landw. Versuchsw. Oesterr., 5 (1902), No. 8, pp. 933–961*).—Studies are reported on the effect of soaking millet seed in solutions of formalin and copper sulphate for the prevention of the smuts *Ustilago crameri* and *U. panici miliacei*. The experiments were conducted to test the effect of the fungicides on the smut spores as well as upon the germination of the seed. It was found that the smut spores were killed by soaking in formalin solutions as follows: One per cent solution for 15 minutes, ½ per cent solution for 1 hour, or ¼ per cent solution for 3 hours. If thoroughly washed, after soaking, the strength of the solution may be materially increased and the time diminished. For practical application soaking the seed for 15 minutes in ½ per cent solution, 1 hour in ¼ per cent, or 3 hours in ⅛ per cent solutions is recommended. These treatments may be safely followed without injury to the germination of the seed. Experiments with solutions of copper sulphate were less satisfactory. The copper solutions were less efficient in destroying the fungus spores and more injurious to the vitality of the seed. The effect of neutralizing the copper sulphate solution with sodium hydroxid was tested and this fungicide prevented the germination of the spores to a slight extent only. Extensive quotations and numerous references are given to the work of other investigators who have studied the subject of soaking seed for the prevention of smut diseases.

Treatment of smuts and rusts, D. A. SAUNDERS (*South Dakota Sta. Bul. 75, pp. 7*).—Descriptions are given of the hot water and formalin treatments for oat and wheat smuts, both of which are quite efficient in preventing the diseases. For the prevention of rusts the author states that while many remedies have been tested none has been found that is effective. The burning of the stubble after thrashing is recommended and the sowing of varieties which are known to be resistant.

The prevention of oat smut and potato scab, R. A. MOORE (*Wisconsin Sta. Bul. 98, pp. 23, figs. 3*).—A description is given of the oat smut and a tabular report presented showing the proportionate amount of smutted oats in fields, the seed of which had been treated and untreated. In 172 reports from 15 counties where the seed oats had not been treated there was said to be 16 per cent of the oats destroyed through the action of the smut fungus. In 85 tests in 6 counties where the seed had not been treated the loss amounted to 18.6 per cent, while in 11 tests where the seed had been treated with formaldehyde the loss amounted to only 1.1 per cent. The author computed the loss for the entire State. Basing his figures on the total yield and the average loss as reported, he estimates that the money loss in the oat crop, due to smut, amounts to over $5,000,000 a year. For the prevention of this heavy loss he recommends treating the seed oats with formaldehyde at the rate of 1 pt. of the 40 per cent solution to 36 gal. of water. The seed oats are placed in gunny bags and submerged in the solution for 10 minutes, after which they are spread to dry. The experiments conducted at the station and in cooperation with it have shown the efficiency of this treatment, and the amount of fungicide mentioned above is sufficient for the treatment of from 40 to 50 bu. of oats. It is stated that through the intervention of the station at least 10,000 Wisconsin farmers treated their seed oats with this solution during the past year.

The same method of treatment is recommended for the prevention of potato scab. In this case the potatoes should be completely submerged in the liquid and left for 2 hours, or if the potatoes are very scabby for 2½ hours.

Some potato diseases (*Jour. Bd. Agr.* [*London*], *9* (*1902*), *No. 3*, *pp. 307–311*, *pls. 3*).—Descriptive notes are given on the black scab, bacterial disease, and sclerotium disease of potatoes. The black scab, which is said to be due to *Œdomyces leproides,* has been previously described as occurring on beets (E. S. R., 14, p. 57). During the autumn of 1901 specimens of diseased potatoes were received from the neighborhood of Liverpool, and during the season of 1902 similarly diseased tubers were observed from a number of localities in England. On the potato the fungus produces a continuous rough, black, scab-like, thick crust, which usually commences at one or several distinct points and finally covers the entire surface of the tuber. The central portion of the diseased tubers remains sound, the fungus never spreading beyond the surface layer. If left lying on the ground the entire tuber becomes dry, eventually crumbling to pieces. Diseased tubers should be collected and burned or deeply buried, and land which has produced a diseased crop should receive a liberal dressing of lime.

The bacterial disease of potatoes due to *Bacillus solanacearum* has been reported from a number of localities, and the author recommends the spraying of the potatoes for the destruction of the leaf-eating insects as a preventive measure. If potatoes are dug as soon as the disease is indicated by the wilting of the leaves, a considerable portion of the crop may be saved by storing the tubers in a cool, dry place.

The sclerotium disease of potatoes is characterized by the growth of the fungus on the base of the stems just above the ground line. The tubers are never directly attacked by the fungus, but their growth is either checked or entirely arrested by the destruction of the above-ground parts of the plant. The fungus first appears at the base of the stem as a white, fluffy mass surrounding the stem, and after a time this mold collapses and bears numerous black bodies about the size of a grain of wheat. During the period of this development the potato stem and leaves have become wilted and both perish soon after. The only certain method of combating this disease is the collection and burning of all diseased plants. In addition to the potato, the fungus, which is *Sclerotinia sclerotiorum,* attacks a number of other garden and field plants.

A new potato disease, M. C. POTTER (*Jour. Bd. Agr.* [*London*], *9* (*1902*), *No. 3*, *pp. 320–323*, *pl. 1*).—During the autumn of 1900 the author's attention was turned to potatoes presenting the irregular, tumor-like swellings characteristic of the club root of turnips. These excrescences consist of masses of thin-walled parenchymatous cells rich in starch. Spores are produced in great abundance, but all attempts to secure their germination failed. The author was able, however, to infect sound potatoes and reproduce the disease by inoculating the soil with the spores. Pot experiments are reported upon in which potatoes were grown and the disease produced, the pots being allowed to remain with the soil undisturbed until the next spring. A second planting showed that the parasite could be carried over winter by means of spores in the soil and infest succeeding crops. The author believes that the attack of the disease begins at or near the eyes of the potato, the parasite easily gaining entrance through the young and tender structures existing at those points. This disease is believed to be identical with that formerly described by Schilberszky from Hungary, which is attributed by him to the fungus *Chrysophlyctis endobiotica.* At present the author has observed the disease from but a single locality, but on account of the possibilities of it proving to be destructive he calls attention to it and suggests that all seed tubers should be carefully examined before planting and those which are diseased be burned or deeply buried.

The potato disease, E. A. Nobbs (*Agr. Jour. Cape Good Hope, 22* (*1903*), *No. 1, pp. 25–29, pls. 2*).—A description is given of the potato rot due to *Phytophthora infestans*, and the protection of the plants by the repeated and thorough spraying with Bordeaux mixture is recommended as a preventive treatment. In addition to *P. infestans* the author states that *Sporidesmium exitiosum* has been recently noticed as causing considerable injury to potatces, and suggests that possibly other fungi may be found upon more critical examination.

A nematode disease of rice, J. van Breda de Haan (*Meded. 'S Lands Plantentuin, 1902, No. 53, pp. 65*).—This disease, which is very destructive in some parts of Java, causing the loss of from one-third to nearly the entire rice crop, is due to a hitherto undescribed nematode belonging to the genus Tylenchus, called by the author *T. oryzæ*. The disease is characterized by a reddening and dying of the leaves in longitudinal strips. In dying, the leaves remain flat. The roots lose their white appearance, become brownish and wrinkled, and finally decay. The author describes the nematode and gives some account of its habits and life history. The adults live in the soil while the larvæ attack the roots. The disease is carried from field to field by the laborers, on tools, and by means of the irrigation water, but is never transmitted by means of seed. Methods of combating the trouble are suggested, among which are greater care to prevent its spread, providing the young rice plants with the best chance to form an abundance of good roots, and proper crop rotation in order to destroy the organism in the soil. All varieties of rice are subject to the disease, though some are less severely attacked than others.—H. M. PIETERS.

Tobacco diseases in Galicia, M. Raciborski (*Abs. in Bot. Centbl., 90* (*1902*), *No. 15, p. 419*).—A report of studies on the diseases to which tobacco is subject is given. Among those mentioned are the diseases of roots which are said to be due to bacteria, and diseases of the stem and leaves which are caused by the fungi *Erisyphe communis*, *Sclerotinia sclerotiorum*, *Phyllosticta tabaci*, *Ascochyta nicotianæ*, and *Capnopodium salicinum*. In addition to these diseases others are described which are attributed to atmospheric influences, and descriptions are also given of the mosaic disease of tobacco as well as other somewhat similar affections.

Erysiphe lamprocarpa on tobacco, G. E. Anastasia (*Extr. from Bul. Tec. Coltiv. Tabacchi, Scafati* [*Salerno*], *1* (*1902*), *No. 1, pl. 1; abs. in Bot. Centbl., 90* (*1902*), *No. 20, p. 556*).—The author claims that the form of *Erysiphe lamprocarpa* which occurs parasitically on tobacco is related to the conidial form (*Oidium tabaci*). The difference in resistance of the different varieties of tobacco to this fungus is pointed out.

Apple fungi, G. H. French, J. C. Whitten, J. C. Blair et al. (*Trans. Amer. Apple Growers' Cong. 1902, pp. 76–99*).—Popular descriptive notes and discussions are given of a number of the more common and destructive fungus diseases of the apple and suggestions given for their prevention. The results of experiments for the control of these diseases are given in some detail.

A contribution to the knowledge of Monilia diseases, K. Schilbersky (*Magyar Bot. Lapok, Budapest, 1* (*1902*), *No. 5; abs. in Bot. Centbl., 90* (*1902*), *No. 20, p. 565*).—The author claims that *Monilia fructigena* and *M. cinerea* are specifically related, and prefers their designation as *M. fructigena genuina* and *M. fructigena cinerea*.

The rotting and mummifying of fruits, P. Passy (*Rev. Hort.* [*Paris*], *75* (*1903*), *No. 2, pp. 43–46, figs. 7*).—An account is given of the attack of *Monilia fructigena* on apples, plums, etc., and suggestions given for its prevention.

A disease of plums, J. Dufour (*Chron. Agr. Canton Vaud, 15* (*1902*), *No. 13, pp. 375–378, figs. 2*).—Descriptions are given of the effects produced by the fungi *Exoas-*

cus pruni, *E. deformans*, and *E. cerasi* upon their host plants, and suggestions given for combating their injurious attacks.

Notes on a disease of lemons in Sicily, G. Briosi and R. Farneti (*Separate from Atti Inst. Bot. Univ. Pavia, 2. ser., 8 (1902), pp. 4*).—A description is given of a very serious disease of lemons that is known in Sicily as the white rust. A study of the materials sent the authors led them to decide that the disease was due to an undescribed species of Ovularia to which the name *O. citri* is provisionally given. The fungus is possibly related to and greatly resembles the *Oospora hyalinula* of Saccardo.

Diseased cocoanut palms (*Agr. News [Barbados], 2 (1903), No. 23, p. 67*).—A brief account is given of some diseases of the cocoanut palm, some of which have been previously described (E. S. R., 14, p. 671).

Raspberry cane blight and raspberry yellows, F. C. Stewart and H. J. Eustace (*New York State Sta. Bul. 226, pp. 331–366, pls. 6*).—Preliminary to a complete account of the diseases of the cultivated raspberries, blackberries, and dewberries, the authors describe a disease that has proved exceedingly destructive to the raspberry. This disease, under the name cane blight, was previously briefly mentioned (E. S. R., 13, p. 149) and appears to have escaped the attention of vegetable pathologists. Their observations begun in 1899 were extended through subsequent seasons and results of their studies are given in the bulletin.

The cane blight attacks both red and black raspberries and occurs probably on the dewberry, but so far as their observations go the blackberry is exempt. The principal damage is done to the fruiting canes, although the new shoots are attacked and occasionally killed during the first season of their growth. The foliage on the affected canes wilts suddenly and becomes dry, involving either the whole cane or only a portion. It is most conspicuous about fruiting time, and canes loaded with ripening fruit suddenly wilt and dry up. The disease does not spread from a center, but canes here and there throughout the plantation are affected, and thrifty, well-cared-for plantations appear to suffer as well as neglected ones. In general the disease is more destructive in old plantations, and the virulence seems to increase with the age of the plants.

The disease is of fungus origin, and is due to an undetermined species of Coniothyrium, closely related to if not identical with *C. fuckelii*. Inoculation experiments have shown that the disease can be readily produced by inserting the spores of the fungus, both old and new canes yielding to the disease within 2 months after inoculation. Investigations as to the time and manner of natural infection seem to indicate that the new canes are attacked in the late summer or autumn, although there is evidence that infection may occur on the fruiting canes early in the spring. The fungus seems to gain entrance through wounds, particularly those produced by the snowy tree-cricket (*Œcanthus niveus*).

During August and September the new canes of red raspberries frequently show a brownish or bluish-black coloration, extending more or less around the canes. These were supposed to represent the initial stage of the cane blight, but the authors' investigations show that the discoloration is due to *Sphærella rubina*, a rather common fungus which is not of very great importance. Spraying experiments for the prevention of the cane blight have proved futile, in one case the spraying apparently increasing the disease. Preventive measures are suggested, by which the disease may be kept in check, it being recommended that healthy plants be chosen, that all diseased canes be removed, and the general health of the plants protected by the use of fungicides.

The Marlboro red raspberry apparently is subject to a disease which is quite destructive to that variety, although not confined entirely to it. This disease the authors designate as raspberry yellows and the affected plants have a stunted yellowish appearance suggestive of peach yellows and the Bermuda lily disease. On fruiting canes the fruit-bearing shoots are dwarfed, the leaves are small, curled, and faintly mottled with yellow. Many of the berries dry up without ripening, and those that ripen are small and insipid. This disease is apparently quite an important one, and is to be the subject of further investigation. At present it is believed to be not of fungus origin, and experiments with fertilizers have been without any appreciable effect.

Two new raspberry diseases, F. H. Hall, F. C. Stewart, and H. J. Eustace (*New York State Sta. Bul. 226, popular ed., pp. 11, figs. 2*).—A popular summary of the above bulletin.

The preventive treatment of oidium, de Boissard (*Rev. Vit., 18 (1902), No. 469, pp. 672, 673*).—The writer calls attention to the fact that for 9 years he has successfully combated the occurrence of powdery mildew on grapes by washing the stock with a 10 per cent solution of copper sulphate. The vines are heavily sprayed or washed with this solution during their dormant period, and as a result the following season no trace of mildew has been observed. This treatment not only destroys the fungus spores, but also mosses and lichens which may be present upon the grapevines, as well as being destructive to numerous insects which are found in the cracks of the bark.

Brunissure, P. Viala (*Rev. Vit., 18 (1902), No. 467, pp. 610, 611, pl. 1*).—The author reviews previous investigations regarding the cause of brunissure, describes its characteristics, and suggests its possible causes.

The brown rot disease of redwood, H. von Schrenk (*U. S. Dept. Agr., Bureau of Forestry Bul. 38, pp. 29–31, pls. 2*).—The only disease of the redwood of any particular importance is said to be that known as butt, brown, or pin rot. The brown rot causes the wood to become very brittle, having properties quite similar to charcoal. The decay starts in the inner rings of the heartwood and extends outwardly until all the heartwood is pitted. The brown rot starts at or near the ground and extends from the roots upward into the trunk for distances varying from 3 to 50 ft., but as a rule does not go more than 10 or 15 ft. into the butt. So far the author has not been able to identify any fungus as the cause of this disease, but from the close resemblance of the brown rot to a similar disease of *Libocedrus decurrens* it is thought possible that the two may be due to the same or related species of fungi. The brown rot does not cause any great amount of damage and measures for its prevention are impracticable. The decay of redwood poles used for telegraph and other purposes has been observed, which is similar to the brown rot, and it is recommended that this decay could be probably retarded by the thorough drying of the poles before setting them or by coating with some preservative substance.

A disease of the white ash caused by Polyporus fraxinophilus, H. von Schrenk (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 32, pp. 20, pls. 5*).—A description is given of the white rot of ash caused by the growth of *Polyporus fraxinophilus* in heartwood of the trunk and branches of the white ash. This fungus changes the wood into a soft, pulpy, yellowish mass, making it unfit for lumber purposes. A diseased tree may be readily recognized by the conspicuous sporophores which usually occur in considerable numbers about every dead branch or stub. The fungus attacks ash trees of all ages, usually, however, those that are more than 7 in. in diameter. It begins growth in a wound or a dead branch and spreads to the main trunk. A technical description is given of the fungus and the microscopic changes which the wood undergoes. As a result of experiments the author has found that the fungus will not grow very well in dead wood. As preventive measures in parks and grounds the diseased trees should be cut down and in pruning wounds should be covered with some antiseptic.

A new orchid parasite, L. Montemartini (*Separate from Atti Inst. Bot. Univ. Pavia, 2. ser., 8 (1902), pp. 3, pl. 1*).—A description is given of *Uredo aurantiaca*, n. sp., a rust fungus recently discovered attacking the leaves of the orchid (*Ocnidium* *cavendishianum*). The fungus is technically described and its effect on the host plant shown.

A pelargonium disease, G. Massee (*Jour. Roy. Hort. Soc.* [*London*], *27* (*1902*), *p. 172; abs. in Bot. Centbl., 91* (*1903*), *No. 1, p. 15*).—A description is given of a rust of Zonal Pelargoniums which is caused by *Puccinia granularis*. This fungus is said to be not uncommon on various wild plants belonging to the family Geraniaceæ and in all probability passed to imported cultivated forms from the indigenous species.

Fairy ring spot of carnations, P. Voglino (*Extr. from Ann. R. Accad. Agr. Torino, 45* (*1902*), *pp. 1–13, pl. 1; abs. in Bot. Centbl., 90* (*1902*), *No. 6, p. 165*).—A description is given of a disease which has been variously called smut of carnations, fairy ring spot, etc., which is due to the fungus *Heterosporium echinulatum*. The author objects to the designation "smut," claiming that this name should be retained for diseases caused by various species of Ustilagineæ. The pathological conditions produced by the fungus are described as well as its spore formation and other characters. The fungus occurs in the leaves and results in the malformation of the flowers. The disease develops rapidly and is readily reproduced artificially, infections being produced within a day or two.

Preliminary efforts to develop a continuous process of seed disinfection by means of formaldehyde vapor, H. L. Bolley (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 74–81, pl. 1*).—In experimenting with formaldehyde as a disinfectant for seeds, the author made a particular study regarding the disinfection of flaxseed, which, on account of its nature, does not admit of soaking or sprinkling. For treating this seed it is necessary to submit it to vapor, and passing the seed continuously through the vapor was believed to give the best results. Various forms of apparatus were devised, which are figured and described. The preliminary efforts made at disinfecting flaxseed by means of formaldehyde gas are said to have produced good results. As to the use of gas treatment upon other grain there seems to be little probability that methods will be found less tedious or difficult than the simple method of sprinkling with the fungicide.

The use of the centrifuge in diagnosing plant diseases, H. L. Bolley (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 82–85*).—The author discovered while examining samples of grain in a centrifuge that this machine could be used for diagnosing plant diseases. The method is quite simple. It consists merely of placing a sample of the seed grain shaken with distilled water in the tubes and examining the sediment with a microscope. This method is so effective that spores of smuts could be detected in samples of seed which would otherwise be pronounced free of all smut. In a study of flaxseed it was found that gasoline could be used in place of water to considerable advantage. While examining the flaxseed for the wilt disease the author found that in addition to the *Fusarium lini* a number of other fungi are almost as constantly present as the Fusarium, and it is probable that they exert a considerable influence on the production of the flax wilt. In a study of flaxseed it was shown that the spores of *Fusarium lini* are almost universally distributed throughout the flax belt and were present in over 85 per cent of all samples examined.

Early spraying as a means of protection against spring frosts, L. Degrully (*Prog. Agr. et Vit.* (*Éd. L'Est*), *24* (*1903*), *No. 9, pp. 257, 258*).—Heavy applications of a solution of 40 to 50 kg. of iron sulphate in 100 liters of water made just before the buds begin to swell are said to be beneficial in reducing various grape diseases and also by temporarily checking the growth of grapevines to greatly lessen the liability to late spring frosts. The effect is only temporary and growth is checked for but a short time. Experiments are to be conducted to ascertain how long the protective influence may be exerted.

The reduction of lime in fungicides sprayed upon leaves, G. E. Marchetti (*Staz. Sper. Agr. Ital., 35* (*1902*), *No. 11–12, pp. 922–925*).—A discussion is given of some of the changes that take place in the lime in Bordeaux mixture and other fungicides when exposed upon leaves.

ENTOMOLOGY.

Thirty-third annual report of the Entomological Society of Ontario, 1902 (*Rpt. Ontario Ent. Soc. 1902, pp. 132, pls. 2, figs. 108*).—This report contains the proceedings of the thirty-ninth annual meeting of the Entomological Society of Ontario, held in London, October 29 and 30, 1902, and the proceedings of the fourth annual meeting of the Northwest Entomological Society, held at Calgary, November 5, 1902. At these meetings a number of papers were read, among which the following may be briefly noted:

The pea weevil, J. Fletcher and W. Lochhead (pp. 3–15).—The serious nature of this pest in Canada was discussed by both speakers. It is suggested that the insect might be nearly or quite exterminated by adopting the proper measures. The remedies recommended include holding over the seed until the second year, treating it with kerosene, or fumigating it with bisulphid of carbon. The last-named remedy is considered the most effective. Farmers are urged not to sow infested peas, to harvest the crop as soon as ripe, and thrash at once, and to treat seed peas as soon as convenient.

Report on injurious insects in 1902, G. E. Fisher (pp. 15–22).—Biological and economic notes on cankerworm, pear psylla, white-rose scale, and San José scale.

Insect life, T. W. Fyles (pp. 23–31).—The author presents biological notes on a number of common insects, including periodical cicada, *Catocala parta*, syrphus flies, lace-winged fly, and various parasites.

W. Lochhead (pp. 31–36) gave notes on the life and work of a number of experts on Lepidoptera. C. H. Young (pp. 37–44) presented brief notes on the birch skeletonizer, tomato worm, zebra caterpillar, cabbage butterflies, tent caterpillar, codling moth, white-marked tussock moth, potato beetle, asparagus beetle, etc. C. Stevenson and J. A. Moffat (pp. 57–60) gave short biological accounts of *Alaus oculatus*, tent caterpillar, cresphontes butterfly, asparagus beetles, and cabbage butterfly. H. H. Lyman (pp. 61–63) gave a brief account of the life history and habits of *Danais archippus*. W. Lochhead (pp. 64–69) reported observations on Hessian fly, pea weevil, clover-seed midge, wireworms, cutworms, squash bug, potato-stalk borer, codling moth, apple maggot, plum curculio, and bud moth. T. W. Fyles (pp. 69–74) gave notes on the paper-making wasp of Quebec, its habits, structure of nest, etc. A. Gibson (pp. 74–78) read a paper on Some Interesting Habits of Lepidopterous Larvæ. The species noted included *Procris americana*, tent caterpillars, *Phlyctænia ferrugalis*, brown-tail moth, etc. The same author (pp. 79, 80) gave a brief account of the injuries caused to the American larch by *Semiophora youngii*. J. Fletcher (pp. 80–92) presented economic notes on pea aphis, grasshoppers, pea weevil, blister beetles, San José scale, grapevine leaf hopper, pear slug, and Mediterranean flour moth. W. Lochhead (pp. 101–114) gave an analytical key for the identification of insects injurious to apple, plum, pear, cherry, and peach trees. W. H. Herrington (pp. 114–117) gave an account of the life history of *Monohammus confusor*, *M. scutellatus*, etc., injurious to pines.

The Northwest Entomological Society decided to abandon its organization and voted to establish a new society under the title: The Territorial Natural History Society.

Second report of the State entomologist, W. E. Britton (*Connecticut State Sta. Rpt. 1902, pt. 2, pp. 99–178+X, pls. 15, figs. 19*).—A copy is given of the insect-pest law of Connecticut, together with a brief outline of entomological work for the year, and the organization, equipment, and publications of the department. A list is given of nursery firms which received certificates during 1902.

In a series of experiments to destroy the San José scale crude oil undiluted and in 25 per cent mixture with water, kerosene in 25 per cent mixture with water, soda soap (1 lb. per gallon of water), Naphein (½ pt. in 2 gal. of water), and lime-sulphur-salt mixture were used. Where the 25 per cent crude oil or kerosene were used on pear trees no living insects were found on the following May. About 13 per cent were found to be alive on apple trees sprayed with the same mixtures. Lime-sulphur-salt wash was used on plum and peach trees and proved very effective without injuring the trees. Naphcin was of little use. The owners of a large orchard sprayed 7,000 trees just before the buds opened, with the California mixture. The author examined the orchard in July and August and found that the insecticide had proved exceedingly effective. Oil was also used by many orchardists with satisfactory results in most cases. Soda soap proved to be of little value. The California wash was used by orchardists in a number of large peach orchards with satisfactory results. In November, 1902, 3 large apple trees were fumigated with hydrocyanic-acid gas. An examination made on January following showed that no living insects remained. The author's general recommendations in the treatment of San José scale is to remove worthless trees, burn out injured branches, and spray during the winter months with California wash.

A number of natural enemies of the San José scale were observed in this State. *Chilocorus bivulnerus* were very abundant and nearly exterminated the scales on some trees. *Pentilia misella* was also efficient in the destruction of scales. A fungus enemy was observed and is believed to be a species of Capnodium. A circular letter was sent out to entomologists and horticultural inspectors to obtain evidence concerning the relative degree of infestation of different plants by the San José scale. From the 45 replies obtained from the 80 circulars sent 3 lists of plants are prepared according as the plants are badly infested, occasionally infested, or not infested.

Brief notes are also given on apple-tree tent caterpillar, white fly, brown-tail moth, raspberry-cane maggot, hickory-bark borer, currant worm, asparagus beetles, spinach-leaf miner, *Anisota senatoria*, *Anomala binotata*, *Aspidiotus forbesi*, etc. The elm trees in New Haven and elsewhere were observed to be considerably pruned by gray squirrels. It appears that these animals cut off the twigs so as to obtain the seeds upon the ground. It is stated that the report concerning the presence of the brown-tail moth in Connecticut is unfounded.

Report of the State entomologist on the noxious and beneficial insects of the State of Illinois, S. A. FORBES (*Twenty-first Rpt. State Ent. Illinois, 1900, pp. 184+XVIII, pls. 13, figs. 97*).—This report contains a reprint of Bulletins 56 and 60 of the Illinois Station (E. S. R., 11, pp. 654, 655; 12, p. 866).

Report of the State entomologist on the noxious and beneficial insects of the State of Illinois, S. A. FORBES (*Twenty-second Rpt. State Ent. Illinois, 1903, pp. 149+XX, pls. 9, figs. 32*).—A portion of this report consists of reprints of Illinois Station Bulletins 71, 72, 79, and 80 (E. S. R., 14, pp. 270, 271, 673, 675). The parts of the report which have not been previously noted may be referred to in this connection:

Experiments and observations on the use of crude petroleum and pure kerosene for the San José scale (pp. 91–95).—In these experiments crude petroleum and kerosene were sprayed on March 12 and 15 upon 52 trees, including apple, cherry, pear, and peach; 31 trees were treated with kerosene and 21 with crude oil. On June 15 no living scales could be found on any of the trees except 3 badly infested apple trees. No injury was noted except upon the peach trees, and of the 24 which were treated only 4 escaped injury. In an examination of 40,398 trees sprayed with crude oil in the Catawba Island district of Ohio it was found that only 6,448 were entirely without injury. As stated in the following proportion, 16 per cent were uninjured, 54 per cent slightly injured, 15 per cent seriously so, 7 per cent nearly killed, and 8 per cent killed outright.

Experiments with summer washes for the San José scale (pp. 96, 97).—A kerosene emulsion with whale-oil soap, containing 10 per cent kerosene; and a mixture of soda, potash, sulphur, and whale-oil soap were used. The latter insecticide was applied to 58 trees infested with San José scale. Detailed notes are given on these experiments. It was found that the 2 summer washes which were used destroyed only young scales and served merely as a slight temporary check upon the spread of the insect.

On the principal nursery pests likely to be distributed in trade (pp. 98–138).—These notes on a large number of insects and fungus diseases observed upon various economic plants are of especial interest on account of the possibility of their being spread by nursery trade.

The cankerworm on shade and forest trees (pp. 139–144).—At Jacksonville, Ill., great injury was done to elm trees by the cankerworm. Bands of gas-tar and other material was applied to the trees and 199 trees were sprayed with arsenite of lime, at a cost of about 84 cts. per tree. In the spring further banding operations were carried on. The insecticide operations seemed to give promise of good results.

The Colaspis root worm (pp. 145–149).—*Colaspis brunnea* was observed injuring the roots of corn. The damage consisted chiefly in eating away the tap root. Other insects were associated with the Colaspis in this work. Descriptive and economic notes are given on this species. Until further details are learned concerning its life history it is impossible to recommend successful remedies.

Second biennial report of the Montana State Board of Horticulture, 1901–2, C. H. EDWARDS (*Montana State Bd. Hort. Rpt. 1901–2, pp. 125, pls. 30*).—A copy is given of the law creating the Montana State Board of Horticulture and prescribing its powers and inspection duties. The rules and regulations adopted by the board are also presented together with an account of the meetings of the Board and business transacted. The State has been divided into inspection districts with an inspector in charge of each district, and the reports of the different inspectors contain notes on the special conditions of the orchards and nurseries in different parts of the State with reference to the prevalence of insect and fungus diseases.

The codling moth is considered the most important pest with which the board has to deal, this insect having recently secured a foothold in Helena, Missoula, and elsewhere. The San José scale has not been found in Montana. Notes are given on clover mite, red spider, root nematodes, plum curculio, crown gall, oyster-shell bark-louse, apple-bud moth, apple-tree anthracnose, flat-headed apple-tree borer, woolly aphis, etc., and remedies are suggested for controlling these pests.

Nursery inspection in West Virginia, J. H. STEWART (*West Virginia Sta. Rpt. on Nursery Inspection, 1901 and 1902, pp. 64, pls. 5, fig. 1*).—During the work of inspecting nurseries and orchards of West Virginia it was found that all nurseries, with one exception, were apparently free from dangerous insects and fungus diseases. In the prosecution of this work 98 orchards, growing 270,000 trees, were inspected, and the San José scale was found on about 141,000 of these trees in 55 orchards. These orchards included fruit trees of various kinds. Detailed notes are given on the conditions found in the various orchards. San José scale was thus found to be generally scattered throughout the State. Notes are given on the habits and life history of this insect and on the treatments which have been found most effective in combating it. These remedies include the encouragement of natural enemies, the destruction of infested plants, spraying with oils, whale-oil soap, and the California wash. Notes are also given on various other diseases and dangerous insects which are mentioned in the State law concerning insect and fungus pests. As a result of the experimental insecticide work conducted in this State it was found that crude petroleum or any of its local products will kill San José scale, but is also likely to injure fruit trees if used undiluted. When mixed with 3 or 4 parts of water this substance was as effective in destroying the scale as when used in somewhat greater strength. Kerosene was found to be equally as effective as crude petroleum. The author believes from his experiments that paraffine is the constituent of oil which is most likely to injure trees.

Proceedings of the Entomological Society of Washington (*Proc. Ent. Soc. Washington, 5 (1903), No. 3, pp. 167–236, figs. 7*).—Among the articles contained in this number of the proceedings the following may be mentioned: Recent Work in North American Lepidoptera; A New Genus and Species of Geometridæ; North American White-Marked Species of Eucosma; Lepidoptera Collected at Williams, Ariz., by H. G. Dyar. W. A. Ashmead read a paper on New Genera in the Cynipoidea; N. Banks, on Brachynemuri of the *B. ferox* Group; A. Busck, on Brackenridge Clemens' Types of Tineina, and on Dimorphism in the Codling Moth. A. N. Caudell presented a paper on Nomenclature of Blattidæ. The form of codling moth is described as a new variety under the name *Cydia pomonella simpsonii.*

Report on injurious insects and plant diseases in 1902, W. M. SCHÖYEN (*Beretning om Skadeinsekter og Plantesygdomme i 1902. Christiania, 1903, pp. 46, figs. 21*).—As in other annual reports by the author, attention is called to the more important insect outbreaks during the season. A large number of injurious insects are mentioned, being classified according to the plants to which they were injurious. On cereals the chief injuries observed were due to crane flies, grain aphis, and frit fly. Grasses were attacked by *Charæas graminis* and *Cleigastra flavipes.* Clover was injured to considerable extent by *Sitones lineatus.* Notes are also given on the pea weevil, cabbage-root maggot, *Haltica nemorum*, cabbage worms, tarnished plant bug, pear-tree psylla, pear-leaf blister-mite, apple scab, black rot of apples, currant sawfly, *Bombyx pini, Rhizotrogus solstitialis, Lophyrus rufus*, etc.

Injurious insects, E. FLEUTIAUX (*Jour. Agr. Prat. Pays Chauds, 2 (1903), No. 10, pp. 495–502*).—Brief notes are given on insects injurious to sugar cane in Java, and on a weevil which attacks the banana in Madagascar. This weevil was determined as *Sphenophorus sordidus.* A list is also given of injurious insects captured in Guadaloupe.

Recent experience with destructive insects, MARY E. MURTFELDT (*Missouri State Hort. Soc. Rpt. 1902, pp. 253–258*).—Economic and biological notes on cankerworm, tarnished plant bug, leaf hoppers, raspberry-cane borer, etc.

A new enemy of cereals, F. MALMEJAC (*Meun. Francaise, 18 (1902), Nos. 197, pp. 6–8, figs. 19; 198, p. 33; 199, p. 56; 200, p. 79; 201, p. 105, 106; 202, pp. 125, 126*).—The author describes a new species, under the name of *Pentatoma triticum*, a bug which is said to have caused considerable damage to wheat. The insect is described in considerable detail and elaborate notes are given on the character of the damage caused by its attacks. It was found to attack chiefly the heads of wheat and more rarely the leaves and other parts. Low temperatures are said to be unfavorable to the species, and it can be destroyed by applications of kerosene emulsion. The insect attacks wheat during the formation of the grain and even after the kernel is dry. The effect of this attack is to increase the moisture and sugar content and to diminish the proteid content.

Hessian fly experiments, H. GARMAN (*Kentucky Sta. Bul. 103, pp. 229–244*).—The purpose of these experiments was to determine the time at which wheat may be planted so as to escape the Hessian fly and avoid injury from freezing. Wheat planted in the fall of 1901 in Kentucky produced rather a poor crop. This was attributed by some to late planting, by others to the Hessian fly, but the author believes it was due to bad weather at the time of planting. It appears that eggs laid late in the season do not hatch. On some infested plats wheat was planted again in the fall of 1902, beginning September 15. The earliest plantings were injured to the extent of 37 per cent, while plats planted from October 13 to 27 were not infested. According to the author's observations, wheat that escapes injury in the fall will be injured in the spring in proportion to its nearness to fall infested wheat.

Experiments were made in the use of air-slaked lime, lime and Paris green in water, Bordeaux mixture, and kerosene emulsion. The following percentages of infestation were observed on plats thus treated: After lime, 25 per cent; after lime and Paris green, 31 per cent; after Bordeaux mixture, 19 per cent; after kerosene emulsion, 9 per cent; untreated trees being infested to the extent of 38 per cent. The author believes that kerosene emulsion might be used on a large scale with good results. It was also found that plowing to a depth of 6 in. greatly reduced the number of flies which emerged. The number of broods of Hessian fly in Kentucky is believed to be 3 per year. Barley was attacked about as badly as wheat, while rye was but little infested. Brief notes are also given on *Isosoma grande*. The author recommends that in order to prevent severe injury in the fall from the Hessian fly wheat should not be planted before October 6.

Woolly aphis or American blight, W. W. Froggatt (*Agr. Gaz. New South Wales, 14 (1903), No. 1, pp. 18–25, figs. 5*).—The author presents a brief account of the history and distribution of this insect. A few experiments were made in combating the pest. It was found that by scraping away the earth for a distance of 2 ft. around the trunk and exposing the main roots, 3 lbs. of tobacco leaf laid upon the roots and again covered with dirt was sufficient to destroy the insect. It is considered advisable to cut off the larger galls before applying the tobacco. Treatment with bisulphid of carbon was found to be exceedingly effective, but rather too expensive for the ordinary orchardist. A brief bibliography of articles relating to the woolly aphis is also given.

Investigating the codling worm, M. O. Cole (*Missouri State Hort. Soc. Rpt. 1902, pp. 318–320*).—By the use of bands the author determined that a large percentage of the larvæ of the codling moth crawl down the trunks of the infested trees and may be caught under bands. On 1 tree 400 larvæ were captured in this way, and it is estimated that this was only a portion of the worms which infested apples on that tree.

The periodical cicada and its occurrence in Maryland in 1902, A. L. Quaintance (*Maryland Sta. Bul. 87, pp. 65–116, pls. 3, figs. 17*).—The author discusses the life history, egg laying, and feeding habits of this insect. Considerable injury may be done by the punctures produced by the cicada while feeding. Both sexes were found to have functional stomachs in which the sap of trees was found by dissecting specimens. Notes are given on the 2 races of cicada and on the dwarf variety, and the insect is described in its various stages. A brief account is presented of the natural enemies of the cicada, the other broods which occur in the State, and detailed notes are given on the distribution of the swarm which occurred in 1902. In combating this insect the author recommends that special attention be given to trees during the coming winter and spring, in order to prevent further injury to the trees by the woolly aphis, which locates upon the scars caused by the cicada. The adults may be destroyed by kerosene emulsion or pyrethrum powder, but where they occur in large numbers no remedy is perfectly effective.

Insect enemies of the redwood, A. D. Hopkins (*U. S. Dept. Agr., Bureau of Forestry Bul. 38, pp. 32–40, figs. 4*).—Descriptive and economic notes are presented on *Vespamima sequoiæ*, *Phlœosinus sequoiæ*, *P. cupressi*, *P. cristatus*, and white ants. The literature upon the subject of insect enemies of the redwood is rather meager and the species mentioned include the most important ones which attack these trees. Few attempts have been made to control these insects and the recommendations regarding remedies are therefore confined largely to an outline of preventive measures. It appears from observations made by a number of persons that the California redwood is immune to the attacks of white ants.

Insect enemies of the evergreens, E. A. Popenoe (*Industrialist, 29 (1903), No. 17, pp. 263–273*).—Notes are given on the habits and life history of *Tomicus cacographus*, *Chalcophora virginiensis*, *Monohammus confusor*, pine-scale louse, red spider on cedar trees, *Monoctinus unicolor*, *Phlœosinus dentatus*, etc.

Lime, sulphur, and salt wash, C. L. MARLATT (*U. S. Dept. Agr., Division of Entomology Circ. 52, 2. ser., pp. 8*).—On account of the recent experiments which have shown the effectiveness of this insecticide in Eastern States, the author prepared a brief account of the history of this insecticide, its effect upon scale insects, and the method of preparing and applying it.

The result of applying crude petroleum to peach trees in Ohio to suppress the San José scale, F. M. WEBSTER (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 119–140, pls. 4*).—A controversial article concerning the value of this insecticide, with special reference to the possible danger from its application. Instances are noted from experiments in Ohio in which great damage was done to peach and other trees.

Crude petroleum as an insecticide, E. P. FELT (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 86–95*).—The results obtained from the experiments of various entomologists with this insecticide are briefly discussed and a number of conclusions are drawn from the results thus far obtained. The effect of crude petroleum and the comparative safety in using it have been estimated quite frequently by different investigators. A brief bibliography of the subject is added to the article.

Insecticides for use in Hawaii, D. L. VAN DINE (*Hawaii Sta. Bul. 3, pp. 25, figs. 7*).—A short general account of the application of insecticides, spraying apparatus, and a discussion of the formulas and means of preparing the common insecticides of various sorts, such as Paris green, arsenate of lead, soda arsenite of lime, pyrethrum, hellebore, arsenic-and-bran mash, kerosene emulsion, whale-oil soap, resin wash, carbon bisulphid, and hydrocyanic-acid gas.

Liquid and dust spraying, J. C. EVANS ET AL. (*Missouri State Hort. Soc. Rpt. 1902, pp. 215–223*).—A number of points connected with the comparative value of liquid and dust sprays were discussed by different speakers. The insect which was chiefly considered in this discussion was codling moth.

Spray calendar, F. H. BLODGETT and T. B. SYMONS (*Rpt. Maryland State Hort. Soc., 5 (1902), pp. 156–163*).—Directions are given with regard to the more important insecticide and fungicide operations required during the different months of the year. The chief insect and fungus pests are briefly mentioned, with formulas for insecticides and fungicides.

A practical means of destroying cockroaches, C. CHALOT (*Jour. Agr. Prat. Pays Chauds, 2 (1903), No. 10, pp. 503, 504*). In combating *Periplaneta americana* the author had best success from trapping the insects in glass vessels containing a small quantity of olive oil and being inclined at an oblique angle so as to make it possible for the cockroaches to enter the neck of the vessels.

The culture of the mulberry silkworm, HENRIETTA A. KELLY (*U. S. Dept. Agr., Division of Entomology Bul. 39, n. ser., pp. 32, figs. 15*).—This bulletin constitutes a brief handbook of information regarding the various processes and manipulations of sericulture. The information was obtained by travels and observations in Italy and France, and by practical experience under sericulturists in these countries. The subjects discussed include the life history of the silkworm, the food plants, instruments necessary for use in silkworm culture, hatching of the eggs, rearing of silkworms, preparations for spinning, preparing the cocoons for market, and the diseases of silkworms.

Silkworm culture, HENRIETTA A. KELLY (*U. S. Dept. Agr., Farmers' Bul. 165, pp. 32, figs. 16*).—A reprint of Bulletin 39, Division of Entomology, with the addition of a few paragraphs relative to the culture of the mulberry (noted above).

Pebrine and related microsporidia, A. LUTZ and A. SPLENDORE (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 2, Orig., pp. 150–157, fig. 1*).—Notes are given on the various species of Nosema which occur in silkworms and other insects. A list is presented of the various insects and fish in which these organisms are found and a brief synoptical table is given for identification of the species of Nosema.

FOODS—NUTRITION.

Third report on food products for 1902, B. W. Kilgore (*Bul. North Carolina State Bd. Agr., 24 (1903), No. 1, pp. 78*).—In carrying out the provisions of the State pure-food law a number of analyses were made which are reported and discussed. In addition to a general summary the bulletin contains the following special articles: Canned Fruits and Vegetables; Bottled Non-Alcoholic Carbonated Beverages—Summer Drinks; Phosphates, Malts, Ciders, and Bitters; Tomato Catsup and Sauces; and Prepared Mustards and Salad Dressings, by W. M. Allen. Cheese; Butter, Renovated Butter and Butterine; and Lard and Compounded Lard, by J. M. Pickel. Baking Powders, by B. W. Kilgore and W. M. Allen. Flour; Corn Meal; and Commercial Stock Feeds, by F. C. Lamb. Condimental Stock Foods and Condition Powders, by T. Butler and F. C. Lamb.

In the last article the authors report analyses of a number of condimental feeds recommended for horses, cattle, and poultry, as well as one recommended as a cure for hog cholera. These feeds were found to consist of such common articles as wheat bran or similar products, linseed meal, charcoal, salt, saltpeter, sulphur, dried blood, fenugreek, red pepper, etc. According to the authors—

"It may be freely stated that the so-called condimental stock foods and condition powders on the market, when tested by accurate and practical feeding trials, when judged as medicines, when compared in price with other materials of the same feeding value, or when measured by the claims made for them by the manufacturers, fail to show merit sufficient to justify their use.

"If the live stock is well and properly cared for and fed, it needs no medicine. If care and feed are needed, the best may be had in any market for less than one-tenth that charged for it when put up in 1 or 2 lb. packages and advertised as 'stock food' or 'condition powder.'

"The question often arises, Why is it if these stock foods are all frauds that so many honest and intelligent men think they have obtained good results from their use? The answer is not difficult. There is in every organism an inherent tendency to return to normal conditions, or, in other words, to get well if sick. When a man gets to the point of buying condition powders for an animal he is ready to give him the better care and food which alone would and does bring about the desired improvement in condition. The 'stock food' gets the credit, although it does contain nothing but wheat bran, charcoal, and pepper and salt. If it is a tonic that the horse, cow, or pig is in need of, why not purchase gentian, iron, and nux vomica direct from the druggist. They will not only cost less, but if medicine is really needed, are much more likely to produce the desired effect."

On the digestibility and availability of food materials, W. O. Atwater (*Connecticut Storrs Sta. Rpt. 1901, pp. 179–245*).—The results of 50 digestion experiments, generally of 3 or 4 days' duration, with 3 healthy young men whose digestive powers were believed to be unimpaired are reported. As a whole the experiments formed a part of the investigations on the metabolism of matter and energy carried on with the respiration calorimeter, 18 being conducted while the subjects were outside the apparatus and 32 with the subjects inside the respiration chamber. The diet was simple, being made up of a number of common-food materials of animal and vegetable origin. In 18 tests the nutrients were provided in about the same proportion as in the ordinary diet; in 17 tests the diet furnished large quantities of fat, and in 14, large quantities of carbohydrates, though the energy in these cases was not greater than was needed to supply the demands of the body under the experimental conditions.

So far as was observed individual peculiarity did not affect the digestion of the several nutrients. "With each subject the range of variation in the results of similar experiments is much wider than the differences between the averages of similar experiments with different subjects."

The sojourn in the calorimeter (i. e., confinement under somewhat abnormal conditions) had little influence on the digestibility of the food. It is said in effect that increasing the quantity of either carbohydrates or fat above those common in the ordinary diet had no influence upon the digestibility of the other nutrients of the diet, while the digestibility of the fat or the carbohydrates in the experiments in which either was used in large quantities was as large, or larger than, in the experiments in which the quantities were more nearly like those in the ordinary diet. In these experiments more or less severe muscular work had no apparent effect upon the digestibility of the different nutrients of the diet.

"It made practically no difference whether the men were as quiet as possible, or were engaged in very light, or moderate, or severe muscular work, the proportions of unavailable material rejected by the intestine were no larger in one case than in the other. That is to say, so far as the using up of the nutrients of the food was concerned, the amount of muscular exercise made no appreciable difference."

Judging by the results of these experiments it appears that on an average the coefficients of digestibility of the nutrients in a mixed diet are: Protein 92 per cent, fat 95 per cent, and carbohydrates 97 per cent. These factors it is noted depend considerably upon the proportions of animal and vegetable foods in the diet, as the digestibility of the nutrients is different in different materials, the protein of animal foods, like meat and milk, being more completely digested and utilized than that of most vegetable foods, like beans or potatoes. The digestibility of the protein of mixed diet will therefore vary according as it contains a larger or smaller proportion of animal food. Roughly speaking, however, about 95 to 96 per cent of the total organic matter and 91 to 92 per cent of the total energy of mixed diet will be digestible.

Percentage composition and pecuniary value of human foods, J. König (*Prozentige Zusammensetzung und Nährgeldwert der menschlichen Nahrungsmittel. Berlin: J. Springer, 1902; rev. in Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 6, p. 286*).—The eighth edition of this useful publication.

Composition and food value of the principal vegetables, Balland (*Rev. Internat. Falsif., 14 (1901), No. 3, pp. 76–78*).—The food value of vegetables is discussed and a table given showing the composition of a large number.

A study of the food value of some of the edible fungi of Ames, J. B. Weems and Alice W. Hess (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 165–172*).—Analyses are reported of a number of samples of mushrooms, including *Coprinus atramentarius, C. micaceus, Hirneola auricula, Hydnum coralloides, Morchella esculenta, Lycoperdon giganteum, L. Gemmatum, Pleurotus sapidus, P. ulmarius,* and cultivated mushrooms, *Agaricus campestris,* including local-grown specimens and French canned goods. The food value of mushrooms is discussed and the fact pointed out that although they are not superior and possibly not equal to ordinary vegetables in this respect, they deserve high rank as condiments and relishes and are of value in adding to the attractiveness of the diet.

Bread making from the standpoint of public health, A. Laurent (*Compt. Rend. 10. Cong. Internat. Hyg. et Démogr., Paris, 1900, pp. 181, 182*).—Suggestions regarding the manufacture of wholesome bread.

The determination of the baking quality of flour by means of the gliadimeter, E. Fleurent (*Ann. Chim. Analyt., 8 (1903), pp. 6–9; abs. in Chem. Centbl., 1903, I, No. 9, p. 542*).—It is stated that the baking quality of flour may be rapidly determined by the gliadimeter, an instrument devised by the author.

Concerning the identification of currant jam, J. Schindler (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 1, pp. 22–26, figs. 2*).—Data are given regarding the chemical and microscopical examination of currant jam.

Antiseptics and their use in the preservation of food, S. C. Prescott (*Tech. Quart., 15 (1902), No. 4, pp. 335–342*).—Much matter regarding methods of preserving foods, condiments, and beverages is summarized and the use of preservatives from the standpoint of hygiene is discussed.

Are antiseptics occurring in preserved foods harmful and should their use be prevented? F. Bordas (*Compt. Rend. 10. Cong. Internat. Hyg. et Démogr., Paris, 1900, pp. 109–120*).—In a paper presented before the International Congress of Hygiene, Paris, 1900, the author considers the preservatives commonly used. The paper is followed by a discussion.

The preservation of meat, L. Vaillard (*Compt. Rend. 10. Cong. Internat. Hyg. et Démogr., Paris, 1900, pp. 99–108*).—A report with discussion presented before the International Congress of Hygiene, Paris, 1900.

The cleavage of gelatin, P. A. Levene (*Ztschr. Physiol. Chem., 37 (1902), No. 2, pp. 81–85*).—Experiments are reported on the cleavage of gelatin by a number of digestive ferments. The resulting products were studied.

The influence of alcohol on the metabolism of protein, R. Rosemann (*Arch. Physiol. [Pflüger], 94 (1903), No. 11–12, pp. 557–592*).—A critical discussion of recently published experiments.

Hydrolysis of fats and oils by means of dilute acids, and some notes on fat-splitting enzyms, J. Lewkowitsch (*Jour. Soc. Chem. Ind., 22 (1903), No. 2, pp. 67–70*).—Experiments are reported in which attempts were made to hydrolyse animal and vegetable fats with hydrochloric acid, as well as tests in which lard was treated with this acid, and zinc dust, and other substances which it was believed would increase the efficiency of the acid, as the reaction seemed to be catalytic. Data are also given regarding the saponification of fat with ferments. A considerable amount of fat was hydrolysed by the acid, the portion varying with the different materials and under the experimental conditions. The substances added to the acid did not increase its effectiveness. The paper is followed by a discussion.

Experiment on the excretion of carbon dioxid during static and negative muscular work, J. E. Johansson and G. Koraen (*Skand. Arch. Physiol., 13 (1902), No. 3–5, pp. 229–250, figs. 2*).—Using the apparatus and methods noted in a previous report (E. S. R., 14, p. 789), a number of experiments are reported with man in which the respiratory quotient was determined when static and negative muscular work were performed. The former term the authors apply to work with the ergometer of such a nature that the external work was equivalent to zero. According to the authors in the case of static and muscular work, the carbon dioxid excreted is proportional within limits to the duration of muscular contraction. These and other deductions are discussed in detail.

ANIMAL PRODUCTION.

The feeding value and digestibility of alfalfa, H. Snyder and J. A. Hummel (*Minnesota Sta. Bul. 80, pp. 172–178, 180, figs. 2*).—On the basis of composition the feeding value of alfafa hay as compared with red clover hay is discussed, and experiments with 2 steers are reported on the digestibility of green alfalfa and alfalfa hay fed alone and with other materials, including a commercial stock food. The experiments were made by the usual methods, specially constructed stalls being used which facilitated the collection of solid and liquid excreta, the feeding being supervised by G. Craig. The average results of the digestion experiments follow, in every case the results given being the average of 2 tests:

Average coefficients of digestibility of alfalfa—Experiments with steers.

	Dry matter.	Protein.	Ether extract.	Nitrogen-free extract.	Crude fiber.	Ash.	Energy of digestible material.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Alfalfa hay, 16 lbs., nearly	65.84	75.38	50.88	71.86	57.57	51.40	64.41
Alfalfa hay, 16 lbs.; corn meal, 5 lbs	70.98	83.63	60.82	73.44	63.29	64.84	70.09
Alfalfa hay, 16 lbs.; corn meal, 5 lbs., and 2 tablespoonfuls International Stock Food	60.70	67.59	27.64	72.42	49.57	49.83	61.20
Green alfalfa, third cutting, 42 lbs	60.62	74.05	38.42	71.73	42.41	40.00	62.81
Alfalfa hay, 16 lbs.; barley meal, 5 lbs., and mangels, 15 lbs	63.57	76.23	63.37	72.02	49.02	62.43	60.51

"Alfalfa hay is equal in digestibility to red clover. It is more digestible when fed with corn or barley meal than when fed alone. . . . When fed green, alfalfa shows a slightly lower digestibility than when fed as dry hay. This is probably due to the more laxative effect of the green food, which gives the digestive fluids less time to act on the food. A comparison of the two trials of the digestibility of alfalfa hay when fed with corn meal with the addition of a condimental food in one case, shows a remarkable difference in favor of the ration without the condimental food."

In the experiment with green alfalfa, according to the authors, the liquid and solid excreta contain 94 per cent of the nitrogen of the food, nearly 75 per cent of this quantity being contained in the urine. The fertilizing value of alfalfa is briefly discussed.

The digestibility of hog millet, H. SNYDER and J. A. HUMMEL (*Minnesota Sta. Bul. 80, pp. 178–180*).—The digestibility of hog-millet seed, ground and fed with water, was tested with a pig weighing about 180 lbs., the details of the experiment being attended to by C. P. Taylor. The test covered 17 meals, both the liquid and solid excreta being collected, the feces being marked with charcoal according to the method commonly followed in experiments with man. The following coefficients of digestibility were obtained: Dry matter 72.75, protein 68.36, ether extract 58.86, nitrogen-free extract 91.56, crude fiber 33.36, and ash 19.17 per cent. The available energy was calculated to be 70.60 per cent. The feed contained 0.905 lb. nitrogen, the urine 0.48 lb., and the feces 0.29 lb. Therefore, there was a gain of 0.14 lb., equivalent to 0.88 lb. of protein. During the test the pig gained 10 lbs. in weight.

According to the authors, the experiment indicates that hog-millet seed is equal in digestibility to barley, wheat, and shorts, but is not as digestible as corn meal or oil meal.

The available energy of timothy hay, H. P. ARMSBY and J. A. FRIES (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 96–109, dgm. 1*).—Cooperating with the Bureau of Animal Industry of this Department respiration calorimeter experiments were made at the Pennsylvania Station with steers. The author briefly discusses some of the results obtained when timothy hay was fed with especial reference to what he terms the metabolizable energy—that is, the energy of the food minus the energy of excreta. The tentative conclusions follow:

"The nutritive value of timothy hay, either for maintenance or production, was not measured by its metabolizable energy, but was in every case materially less. In other words, the digestible nutrients of the hay did not replace body tissue in isodynamic proportions. The work of digestion and assimilation in the case of timothy hay appears to be so great that at, or even below, the maintenance requirement the heat production of the animal is in excess of the amount needed for the maintenance of body temperature.

"The availability of the metabolizable energy of timothy hay, within the range of these experiments, appears to be a linear function of its amount. The experiments afford no clear indication that the availability is less above than below the maintenance requirement."

Combustible gases escaping from an animal, J. A. FRIES (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 110–118*).—In connection with respiration calorimeter experiments with steers, which are being carried on at the Pennsylvania Experiment Station, the author determined the amount of methan in a current of air drawn through the respiration chamber by passing an aliquot portion of this current through absorbers containing sulphuric acid and soda lime to remove water and carbon dioxid, and then through a copper tube filled with platinized kaolin, and heated to a dull red, and finally through other absorbers, which collected the water and carbon dioxid formed by the combustion of the methan. It was found that when the steer received 4,500 gm. of hay daily, the methan carbon was equal to 6.14 per cent of the total carbon. When 5,750 gm. of hay were fed the percentage was 6.09, but when the ration was reduced to 3,250 gm. the percentage was only 5.74, and when the hay was increased to 7,000 gm. the percentage was 7.63, the average of all these values being 6.399 per cent. Tests were also made to determine the amount of combustible gases ordinarily present in the atmosphere. The amount found was very minute, and according to the author it may be justly claimed that the atmosphere does not contain free hydrogen as a universal constituent to the amount of 19.5 cc. in 100 liters of air reduced to 0° and 7.60 mm. The quantity is said to be much smaller and to be variable, at times being either entirely absent or present only in the faintest trace.

Cotton-seed meal vs. decorticated cotton cake, T. WINTER (*Bd. Agr. [London] Rpt. Agr. Education and Research, 1901–2, pp. 51, 52*).—The comparative value of cotton-seed meal and decorticated cotton-seed cake as part of a ration was tested at the University College of North Wales with 2 lots containing 3 Welsh steers each, the basal ration consisting of 4 lbs. maize meal, 70 lbs. pulped swedes, 10 lbs. hay and straw chaff, and 5 lbs. long hay per head daily. In addition the steers in lot 1 were given 4 lbs. of cotton-seed meal and those in lot 2 an equal amount of decorticated cotton-seed cake, the amounts being after a time increased to 10 lbs. The average weight of the steers at the beginning of the test was about 1,120 lbs. and during the 77 days of the test the average daily gain per head in the 2 lots was 1.62 and 2.24 lbs. It was calculated that the gains made by lot 2 gave a net profit of $3.10 per head in excess of those made by lot 1. From this and earlier work[a] it would appear that "although there is not much difference between the market prices of these 2 feeding stuffs, the feeding value of decorticated cotton cake is altogether higher than that of cotton-seed meal."

Cattle-feeding experiment (*Jour. Bd. Agr. [London], 9 (1902), No. 2, pp. 227, 228*).—This test of decorticated and undecorticated cotton-seed cake was noted from another publication (see above.)

Substitutes for cream in skim milk as calf food (*Agr. Gaz. New South Wales, 13 (1902), No. 12, p. 1247*).—Crushed linseed or linseed meal is recommended as the best material for supplementing skim milk in calf feeding. The use of cocoanut-oil cake and other materials is also spoken of briefly.

Feeding experiments with calves (*Ber. Norges Landbr. Hoiskoles Virks., 1901–2, pp. 188–190*).—An experiment was made with "Calf Cream," a food placed on the market by a Dutch firm.—F. W. WOLL.

Experiments in sheep husbandry, T. SHAW (*Minnesota Sta. Bul. 78, pp. 71–87*).—For the last 6 years tests have been carried on at the station to determine whether the breeding habit of ewes could be so modified that lambs would be produced at a season most profitable for market. The conclusions drawn follow:

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[a] Bd. Agr. [London], Rpt. Agr. Education and Research, 1900–1901, p. 47.

"The breeding habit in ewes which usually drop lambs in the spring may be so changed that they will produce them in the fall and early winter. This change can be effected sufficiently for practical uses in from two to three generations of judicious crossing when accompanied by a judicious selection. It may be effected thus quickly by choosing very common ewes of mixed breeding, and mating them with pure-bred Dorset rams, always reserving the earlier dropped lambs for breeding uses. In the transforming process the dams which have suckled winter lambs may usually be bred more readily before being turned out on grass than subsequently, and especially when fed a stimulating grain portion while yet in the sheds. When the change sought has been thus effected in the dams, a superior quality in the lambs may be obtained by using rams in service of certain of the dark-faced types and more especially of the Southdown and Shropshire breeds. Such foods as clover hay, and corn fodder, bran, oats, barley, corn and oil cake, also field roots prove very satisfactory under Minnesota conditions for the production of such mutton in winter. In the markets of the West the demand for such lambs is not yet so good relatively as in certain markets further East."

In earlier experiments at the station the importance to the sheep industry of specially sown pastures has been demonstrated. A test, beginning in May and covering 112 days, was undertaken to learn the value of feeding grain to wethers thus pastured, the crops grazed including winter rye, peas and oats, barley and oats, rape and kale, rape, and peas and oats in succession.

On pasturage alone a lot of 10 wethers weighing about 80 lbs. each made an average gain of 16.8 lbs. per head. When the same number were fed 0.5 lb. of oats per head per day in addition to pasturage, the corresponding gain was 26.9 lbs. After the close of the experiment proper the feeding was continued for 77 days, both lots being given 0.5 lb. grain per head per day. For a month the sheep were pastured on cabbage and later on rape. The lot which received grain during the supplementary test only gained an average of 28 lbs. per head, the lot which had received grain from the start, 34.1 lbs. per head. Definite conclusions regarding the cost of the gain were not drawn, but the author believes that in general "feeding a small grain supplement of oats to wethers that are being grazed is profitable for a period of several months, after which it becomes less profitable, if, indeed profitable to any extent."

Sheep-feeding experiments at Newton Rigg, T. H. MIDDLETON (*Bd. Agr.* [*London*], *Rpt. Agr. Education and Research, 1901–2, pp. 72, 73*).—The comparative merits of mixtures of equal amounts of decorticated cotton-seed cake and corn, linseed cake and oats, and linseed cake and corn fed in addition to Swedish turnips and hay was tested with 3 lots, each containing 16 cross-bred sheep, by the Durham College of Science at Newton Rigg. Practically the same amount of the different feeding stuffs was consumed by the 3 lots in the 54 days of the trial. The lots weighed on an average not far from 1,568, 1,531, and 1,552 lbs., respectively, at the beginning of the trial, the average daily gains per head being 1.21, 1.08, and 1.32 lbs. The greatest profit, $1.68, was obtained with lot 3. According to the author "oats appear to have given a better result than maize; there appears to have been but little difference in the values of cotton and linseed cakes, and no advantage in increasing the maize during the latter stage of the fattening."

Sheep-feeding experiment (*Jour. Bd. Agr.* [*London*], *9* (*1902*), *No. 2, pp. 224, 225*).—Noted from another publication (see above.)

The improvement of pasture at Hatley as tested by the effects on sheep, T. B. WOOD (*Bd. Agr.* [*London*], *Rpt. Agr. Education and Research, 1901–2, pp. 75–77*).—A brief note on the Cambridge University experiments (1901) on the effects of different manures on pasture as shown by the gains made by sheep. In 5 months the greatest gain, averaging 2.49 lbs. per sheep per week, was made on a pasture which had been manured with 0.5 ton basic slag in 1900 and nothing since. The smallest gain, 1.35 lbs. per head per week, was made by sheep pastured on an unmanured plat.

Three types of market sheep, W. L. CARLYLE (*Wisconsin Sta. Rpt. 1902, pp. 72-74, pl. 1*).—On the basis of data derived from an examination of the carcasses of 2 sheep of good type fed generously and 1 fed poorly, marked advantages are pointed out for the former method.

The comparative value and effect upon the lambs of feeding various grain rations to pregnant ewes, W. L. CARLYLE and T. F. MCCONNELL (*Wisconsin Sta. Rpt. 1902, pp. 62-71*).—The effect of different grain rations on ewes and their young was studied, dried brewers' grains being found the cheapest, with bran, shelled corn, and oats following in the order named, all the grains being fed at the rate of 0.5 lb. per head per day.

The authors' conclusions were in effect as follows: Any of the grain rations when fed in connection with 2.5 lbs. of corn silage and 2 lbs. mixed hay per ewe per day was quite satisfactory so far as the physical condition of the ewes was concerned. The results would seem to indicate that the ewes fed the rations containing the largest amount of protein drank the largest amount of water.

When the milk supply of the ewes at parturition is considered, it appears that the dried brewers' grains produced by far the best results. Taking into consideration the size and strength of the lambs at birth, it appears that the ration of whole oats and that of dried brewers' grains produced the strongest and heaviest lambs, with the results slightly in favor of the former.

Corn silage in connection with hay continues to meet with approval as a coarse fodder ration for pregnant ewes in winter. To arrive at more definite results along this line it would be better to have the experimental feeding period extend over a greater portion of the time that the young lamb is dependent upon its dam for existence.

Some observations on sheep breeding from the experiment station flock records, W. L. CARLYLE and T. F. MCCONNELL (*Wisconsin Sta. Rpt. 1902, pp. 42-61, chart 1*).—Noted from another publication (E. S. R., 14, p. 685).

Experiments in sheep breeding, T. WINTER (*Bd. Agr. [London], Rpt. Agr. Education and Research, 1901-2, pp. 53-56*).—In the first of 2 tests made at the University College of North Wales, 3 lots containing respectively 30, 20, and 25 small mountain ewes, were bred respectively with a Wiltshire, Shropshire, and Southdown ram. Twenty-nine living lambs were dropped by the ewes in the first lot, 18 by those in the second lot, and 25 by those in the third. Part of these were sold for slaughter when 4 or 5 months old, the remainder a month later, the average weight of the lambs in the 3 lots when sold being 68, 68, and 67 lbs., respectively.

In the second test 4 lots of 15 ewes each and 1 of 21 ewes, in every case large animals, were used. These lots were bred respectively with Border-Leicester, Shropshire, Oxford, Wiltshire, and Suffolk rams, the lambs dropped being 21, 28, 19, 20, and 30, respectively. The lambs were sold when ready for market. Taking into account the number of early and late sales and other data, the conclusion was drawn that the Suffolk cross gave the best results.

Grazing and feeding experiments with pigs, J. F. DUGGAR (*Alabama College Sta. Bul. 122, pp. 48*).—The principal object of these tests, which extended over 4 years, was to ascertain the relative pork producing value of some of the hog crops of special importance in the South and to study their effect on the quality of flesh and lard, that portion of the investigation, which treated of forage crops being a continuation of work previously reported (E. S. R., 10, p. 577).

To study the relative gains made before and after weaning, a sow and litter of 7 pigs about 1 month old were hurdled on vetch and turf oats and fed some corn in addition for 5 weeks when the sow was removed and the feeding continued with the pigs 3 weeks longer. The latter made an average gain of 22.7 lbs. per week before weaning and 18.5 lbs. after, the area grazed over by the sow and pigs being about 1,710 sq. ft. per week before and 1,286 sq. ft. after weaning. The corn meal eaten per pound of gain was equivalent to 4.88 lbs. before and 4.4 lbs. after weaning. The sow lost nearly 20 lbs. in weight. The unsatisfactory rate of growth is attributed in part to insufficient shade.

Other forage crops tested included Spanish peanuts, chufas, cowpeas, sweet potatoes, sorghum, and spring-sown and fall-sown Dwarf Essex rape. When hurdled on spring-sown Dwarf Essex rape and fed corn in addition the 7 pigs mentioned above gained 103 lbs. in 28 days beginning May 27, requiring 3.1 lbs. of corn meal and the rape from 40.5 sq. ft. per pound of gain. On fall-sown rape 4 pigs gained 263 lbs. in 102 days beginning January 6, requiring 2.5 to 2.9 lbs. of corn per pound of gain in addition to the green feed. During a part of the time they were hurdled on second-growth rape. Assuming that 5 lbs. of corn meal alone is required per pound of gain the author calculates that on an average 1 acre of rape will produce 452 lbs. of pork, worth $22.50.

Seven young pigs used in one of the above tests were grazed on sorghum from June 24 to September 2 and fed in addition 1.5 lbs. of ground cowpeas and corn 1:1 per head daily, and gained 224.4 lbs., equivalent to 635 lbs. per acre of sorghum. The author believes, where labor is cheap or where a corn harvester can be used, that it will be more profitable and more economical to feed sorghum to the pigs than to graze them on it.

Sorghum pasturage in the dough and ripening stages fed with grain or with Spanish peanuts was compared with grain alone and with ripe cowpea pasturage. The grain mixture consisted of corn meal and cowpea meal 2:1. The test covered 5 weeks, sorghum being found of little value, effecting a saving of only 12 per cent of the grain required for a pound of gain. The gains on sorghum and peanuts were unsatisfactory, and the waste was very large with the cowpeas. The lot on grain alone made a very satisfactory growth, producing a pound of gain on 3.74 lbs. of the grain mixture. On an average the author calculates that the sorghum produced 174 lbs. of pork per acre, worth $8.70.

Seven tests with Spanish peanuts are reported, in 6 of which the pigs were penned or hurdled on the peanuts and harvested the crop. In the other pulled peanuts were fed. In 4 tests the forage crop was supplemented by corn meal, and in one by corn meal and skim milk. On corn meal and peanuts the calculated gains due to the peanuts alone ranged from 225 lbs. to 247 lbs. per acre. On skim milk and corn meal the gain attributed to peanuts alone made by a sow and 9 pigs was 432 lbs. per acre. On peanuts alone very small pigs (averaging 28.1 lbs. in weight) made gains equivalent to 503 lbs. per acre.

The gains made in 18 days by lots of 3 pigs each on peanuts and chufas, each fed with a half grain ration, were practically equal (79 and 81 lbs., respectively) and were greater than on a full grain ration (70.5 lbs.). A similar lot grazed on Spanish peanuts without grain gained only 22 lbs. From all the tests of peanuts with grain the author concludes that this crop will produce 333 lbs. of pork per acre, valued at $16.65. In 2 tests peanuts alone produced per acre 281 lbs. of pork, worth $14.05.

In another test young pigs hurdled on chufas and fed a little corn and cowpea meal gained at the rate of 660 lbs. per acre of chufas in addition to 1,429 lbs. of grain. Averaging the results of the 2 tests with chufas the author calculates that an acre would produce 307 lbs. of pork worth $15.35.

For 35 days, beginning in November, 2 pigs were pastured on sweet potatoes and also fed per head daily a half ration (3 lbs.) of ground corn and cowpeas 2:1. The total gains amounted to 67 lbs. The sweet potatoes were not eaten with relish and some were rooted up and wasted. The author believes feeding less grain would have diminished the waste but considers it always advisable to feed a little nitrogenous material as cowpeas, peanuts, etc., with sweet potatoes.

Summarizing his results the author states that an acre of the best of the forage crops tested, namely, peanuts, rape, and chufas, would afford pasturage for 1 month for 25 pigs averaging 100 lbs. in weight, when a half ration of grain was fed in addition. The average amount of grain required per pound of gain in addition to the forage crops tested was as follows: 1.77 lbs. with peanuts, 2.30 lbs. with chufas, 3.07 lbs. with cowpeas, 2.68 lbs. with rape, 3.70 lbs. with sorghum, and 3.13 lbs. with sweet potatoes. From the results of this and previous work at the station covering all told a period of 7 years the author suggests the following succession of forage crops for pigs: Fall-sown rape and chufas, January and February; fall-sown rape, vetch and oats, rye, wheat, etc., March to April 15; vetch and oats, crimson clover, oats and wheat, April; spring-sown rape, vetch and oats, wheat and the usual pasturage, May; spring rape, stubble fields, turf oats, and the usual pasturage, June; sorghum, early varieties of cowpeas, and the usual pasturage, July and August; Spanish peanuts, cowpeas, sweet potatoes, and sorghum, September to November; and chufas and fall-sown rape, December.

Four tests on the effects of cotton-seed meal as part of the ration are reported in detail. A summary of this work follows: When fed corn meal with 20 or 25 per cent cotton-seed meal shoats ate but little and made a very slow growth in most of the tests. "In other experiments they required only 3.84 and 4.68 lbs. of this mixture per pound of growth. . . . Calculated on a basis of 100 lbs. live weight, daily doses of 0.25, 0.40, 0.41 and 0.53 lb. of cotton-seed meal for 34 to 38 days caused sickness or death; 0.61 lb. daily for 35 days fed in different years to shoats of practically the same size caused evident unthrift in one experiment, while in the other no immediate effects were discernible. Shoats averaging 143 lbs. in weight were not hurt by eating for 31 days 0.73 lb. of cotton-seed meal daily per 100 lbs. live weight. Evidently the younger the pig, the more susceptible they are to cotton-seed meal poisoning.

"The health of shoats was injuriously affected or death resulted where, in an exclusive mixed grain ration, the amount of cotton-seed meal consumed per 100 lbs. of live weight reached, with the smallest shoats 9.2 lbs., and with larger shoats 21.4 lbs.; while in a third experiment 21.5 lbs. of cotton-seed meal was consumed per hundredweight without immediate evidences of injury, and in a fourth experiment 22.6 lbs. per 100 lbs. of live weight was consumed without visible effects on the health of large shoats. Where a cotton-seed meal mixture was fed in connection with grazed sorghum, cut sorghum, or grazed peanuts, toxic effects were manifested when respectively 21.6, 18.9, and 17.7 lbs. of cotton-seed meal per hundredweight had been consumed. We obtained highly satisfactory growth when some cotton-seed meal was fed for short periods to shoats while grazing peanuts."

Corn hearts, cowpea meal, and corn bran were compared when fed with equal amounts of rice bran in a test made with 3 lots of 3 pigs each, covering 7 weeks. The feed required per pound of gain was 7.38 lbs. on the corn-heart mixture, 5.95 on the cowpea meal, and 5.5 on the corn-meal ration. In the opinion of the author corn hearts proved decidedly inferior to corn meal and to cowpea meal. Analyses showed that the rice bran used contained 9 per cent protein, and the corn hearts 8.9 per cent.

Several tests are reported in which rice polish was compared with corn and mixed grains, with skim milk, and with corn with and without skim milk. In 1 test the value of different proportions of the rice polish was also taken into account. On an average a pound of gain required 3.73 lbs. of rice polish as compared with 4.74 lbs. corn meal. At this rate 78.6 lbs. of the former was equal to 100 lbs. of the latter, i. e., feeding rice polish effected a saving of 21.4 per cent.

In some of the above tests skim milk formed a part of the ration. In the author's opinion this feeding stuff supplied in moderate amounts effected a saving of about half the grain ordinarily fed.

The effect of the different feeds on the firmness of lard was likewise studied, the results being recorded in detail. Peanuts fed until the pigs were slaughtered caused very soft lard. Chufas had nearly as pronounced an effect. The supplementary feeding of any of the grains tested increased markedly the hardness of the lard, but it is said that feeding grain exclusively for 26 to 35 days just before slaughtering failed to make the flesh and lard as firm as that of pigs which had never been fed peanuts. When 20 or 25 per cent cotton-seed meal was fed in addition to corn meal the melting point of lard was 3.4° F. higher than on corn meal alone.

With several of the pigs the effect of cotton-seed meal and corn meal and of corn meal alone on the weight of the internal organs, the blood, and the dressed carcass was also studied.

"The most significant differences attributable to the foods are the greater weight of kidneys and heart of the pigs receiving the more nitrogenous ration, and the greater weight of lungs (as in our former experiments) when the ration was highly carbonaceous."

Whole corn compared with corn meal for fattening pigs, W. A. HENRY (*Wisconsin Sta. Rpt. 1902, pp. 10–16*).—Using younger pigs than in previous tests (E. S. R., 13, p. 980) the relative value of whole corn and corn meal, each fed with an equal quantity of wheat middlings, was studied. In the first trial, which was made with 4 lots of 3 razorback or razorback crosses, weighing not far from 75 lbs. each, 2 lots on whole corn gained 234 and 169 lbs., respectively, in the 12 weeks of the trial, consuming 4.44 and 5.94 lbs. of whole corn per pound of gain. The 2 lots on corn meal gained respectively 218 and 166 lbs., consuming 4.49 and 5.79 lbs. of corn meal per pound of gain.

The second trial covered 13 weeks and was made with 2 lots of 1 Berkshire and 2 Poland-China pigs each, weighing about 133 lbs. per head at the beginning of the trial. On whole corn the total gain was 255 lbs., the corn eaten per pound of gain being 5.59 lbs. On corn meal the total gain was 274 lbs. and the amount eaten per pound of gain 5.13 lbs.

Summarizing the results of the tests at the station, which have extended over 7 years, the author states that a saving due to grinding has been observed in 9 cases, the amount saved ranging from 3 to 17.6 per cent. In 3 cases a loss ranging from 1 to 9 per cent has been observed. No allowance has been made for the cost of grinding, "the figures given being based entirely upon the gain or loss incurred while feeding."

Results of an experiment to determine the comparative effect upon the growth, development, and character of the carcass of pigs fed upon rations of ground peas and corn meal, W. L. CARLYLE and T. F. MCCONNELL (*Wisconsin Sta. Rpt. 1902, pp. 17–33, figs. 12*).—The comparative value of ground peas and corn meal was studied in continuation of earlier work (E. S. R., 13, p. 979) with 2 lots, each containing 7 pigs (Berkshire, Poland-China, razorback, and razorback crosses), averaging about 68 lbs. in weight at the beginning of the trial. During the test, which covered 28 weeks, 1 of the pigs fed ground peas died. Each of the grains was made into a slop with water and fed ad libitum 3 times a day. The nutritive ratio of the pea meal ration was 1:3.2 and that of the corn meal ration 1:9.8. On the former the average daily gain per pig was 0.837 lb. and on the latter 0.540 lb., the feed eaten per pound of gain being 4.95 lbs. and 6.06 lbs., respectively. In connection with the test the different breeds were compared. The lowest daily gain per pig, 0.55 lb., was observed with the razorbacks, and the greatest gain, 0.75 lb., with lot showing 0.75 Berkshire and 0.25 razorback blood. The latter pigs and 2 other razorback-Berkshire crosses required the smallest amount of feed per pound of gain, namely, 5.2 lbs. The largest amount, 6.17 lbs., was required by the Poland-Chinas. The pigs were slaughtered and the weight of the blood, loose fat, and internal organs recorded. The dressed weight was practically the same in both lots, being about 77 per cent of the live weight.

"While the layer of fat on the outside of carcass is not greatly different in pigs fed peas from those fed corn, partly owing to the better appetites and greater growth and development of the pea-fed lot, yet the amount of lean meat or muscle is so small in the corn-fed lot that the difference in proportion of lean to fat in the different carcasses is readily discernible."

In the opinion of those judging the pigs, the quality of meat in the carcass of one of the pigs was thought to fairly represent all the corn-fed lot. In this "the fat was soft and flabby, almost blubbery to the touch, and the muscle was pale in color and appeared to lack tone."

Individual peculiarity, in the authors' opinion, was responsible for the wide variation observed in the amount and proportion of internal or loose fat in the different pigs.

The results of a feeding trial comparing razorback with cross-bred razorback and improved breeds of hogs, W. L. Carlyle (*Wisconsin Sta. Rpt. 1902, pp. 33–41, figs. 4*).—The relative gains made during the 11 weeks of the trial by pure-bred razorback pigs and crosses was tested with 4 lots of 3 pigs each, lot 1 containing razorbacks of the first generation; lot 2, razorbacks of the second generation; lot 3, razorback-Poland-Chinas, and lot 4, razorback-Berkshires. The pigs weighed about 150 lbs. each at the beginning of the test.

All the lots were fed ad libitum a mixture of equal parts of ground corn, ground rye, and shorts. At the end of 4 weeks skim milk was added to the ration, the amount being on an average approximately 1.4 lbs. of milk to a pound of grain. It was noticed that the razorback pigs especially were exceedingly variable in their appetites, frequently gorging themselves, then eating sparingly for several feeds, and then gorging again. The total gain made by the razorbacks of the first generation was 196 lbs., by those of the second generation 266 lbs., by the Poland-China crosses 346 lbs., and by the Berkshire crosses 358 lbs.

Considering the test as a whole the average daily gain per pig was 1.02 lbs. with the razorbacks and 1.52 lbs. with the cross-bred pigs, the former requiring 4.2 lbs. of grain and 5.65 lbs. of skim milk per pound of gain, and the latter 3.66 and 5.30 lbs., respectively. The importance of adding skim milk to the ration is shown by the fact that while grain only was fed the amount required per pound of gain by the razorbacks was 6.24 lbs. and by the cross-bred pigs 5.66 lbs. After skim milk was added to the ration the amounts were 3.64 and 3.31 lbs. Although definite conclusions were not drawn, as the experiments will be continued, it will be noted that larger gains were made by the improved stock, and that the second generation razorbacks gained more than the first. This is a matter of interest, since it is one of the purposes of the experiments which are being carried on at the station to determine the extent to which liberal feeding and suitable shelter will improve such pigs in successive generations.

Horse feeding, H. Wibbens (*Cultura, 14 (1902), No. 173, pp. 520–524*).—Horse feeding in the province of Groningen, Holland, is discussed with especial reference to the use of molasses.

Establishment of agencies by the Indian Government in Australia for the purchase of horses for military purposes, A. Bruce (*Agr. Gaz. New South Wales, 13 (1902), No. 12, pp. 1178–1181*).—Reasons for the desirability of the establishment of government agencies for the purchase of Australian horses for remounts are given.

Suggestions offered by the Indian Horse and Mule Breeding Commission to Australian breeders, A. Bruce (*Agr. Gaz. New South Wales, 13 (1902), No. 12, pp. 1174–1178, pl. 1*).—The kind of horses required for remounts in India are discussed and suggestions given for raising Australian horses and mules of suitable character.

Mules at the Hawkesbury College farm, H. W. Potts (*Agr. Gaz. New South Wales, 13 (1902), No. 12, pp. 1222–1226, figs. 3*).—The experience at the Hawkesbury Agricultural College was favorable to the use of mules for farm work.

Sugar mules, H. d'Anchald (*Jour. Agr. Prat., n. ser., 5* (*1903*), *No. 5, pp. 152, 153*).—A brief note on the successful feeding of molasses to mules in Louisiana.

Concerning the feeding value of hay from irrigated meadows, F. Tangl (*Landw. Vers. Stat., 57* (*1902*), *No. 5–6, pp. 359–366*).—Sickness among horses on one of the government farms had been attributed to eating hay from irrigated meadows. Botanical and chemical analyses of such hay are reported. In experiments previously noted (E. S. R., 14, p. 900) this hay was fed and no bad effects were observed, although it was given the horses for some 6 months. It was found that the irrigated meadow hay contained very little calcium.

Poultry notes, J. Barclay (*Jour. Jamaica Agr. Soc., 7* (*1903*), *No. 1, pp. 21, 22*).—The relative merits of different breeds of ducks are discussed with special reference to local conditions.

Egg and poultry raising at home, W. M. Elkington (*New York: Charles Scribner's Sons, 1902, pp. 92, figs. 19*).—The choice of breeds, feeding, care of poultry houses, and related topics are treated of.

The peanut for poultry (*Agr. Gaz. New South Wales, 13* (*1902*), *No. 12, p. 1173*).—Statements regarding the successful use of peanuts as a feed for poultry are quoted from the *Texas Stockman*. Regarding their use under local conditions it is said that "wherever peanuts (or earthnuts, as they are sometimes called) have been tried in New South Wales successful results have been reported. They are easily cultivated and the 'nuts,' which grow in a cluster underground, can be dug up and stored for a long time without much care, or fowls or pigs can be turned in to root out the crop for themselves."

Concerning the chemical composition and formation of goose fat, S. Weiser and A. Zaitschek (*Arch. Physiol.* [*Pflüger*], *93* (*1902*), *No. 3–4, pp. 128–133*).—As shown by chemical examination, fat of maize and of broom-corn seed differed quite markedly. Geese were fattened on these grains. Chemical examination showed that the body fat gained on the 2 grains was identical. The authors point out that the amount of fat present in the grains was so small that it would have served for the formation of only a small portion of the body fat and that nearly all must have been formed from carbohydrates.

A new departure in the science of fattening, R. Warington (*Agr. Students' Gaz., n. ser., 11* (*1902*), *No. 2, pp. 35–41*).—On the basis of O. Kellner's experiments (E. S. R., 12, p. 1071) the author discusses the true nutritive value of feeding stuffs as distinguished from the values shown by figures for composition and digestibility.

Analyses of fodders and feeding stuffs, W. O. Atwater (*Connecticut Storrs Sta. Rpt. 1901, pp. 165–178*).—Analyses are reported of a number of feeding stuffs, including ensilage corn, corn and soy-bean ensilage, cured corn stover, oat hay, timothy hay, hay of mixed grasses, oat and pea hay, black grass hay, soy beans, corn, corn meal, corn-and-cob meal, gluten meal, cotton-seed meal, wheat bran, wheat middlings, brewers' grains, grain mixtures, and cereal breakfast food by-products.

Concentrated feeds, J. B. Lindsey (*Massachusetts Sta. Bul. 85, pp. 32, fig. 1*).—Feeds, feeding standards, condimental feeds, and related topics are discussed and analyses made in accordance with the State law are reported of a number of samples of cotton-seed meal, linseed meal, gluten feed, distillers' grains, malt sprouts, wheat middlings, wheat bran, mixed feeds, corn meal, hominy meal, oat feed, corn and oat feeds, dairy and miscellaneous feeds, commercial poultry feeds, meat and bone meals, and meat scraps.

Licensed commercial feeding stuffs for 1902, F. W. Woll and G. A. Olson (*Wisconsin Sta. Rpt. 1902, pp. 250–258*).—A list of feeding stuffs licensed in the State is given and analyses, usually limited to determinations of protein and fat, reported, which were made of a number of feeding stuffs in accordance with the provisions of the State feeding stuff law. These included linseed meal, cotton-seed meal, gluten meals and feeds, germ oil meal, corn bran, hominy feeds, mixed commercial feeds and breakfast food by-products, calf meal, dried grains, dried distillers' grains, germ middlings, granulated bone, blood meal, meat meal, tankage, a chicken feed, wheat bran, middlings, shorts, and red dog flour. The authors state that, as a general rule chemical analysis and microscopic examination showed the wheat milling products to be of superior quality, and free from any adulteration, with the exception of the output of a few mills whose goods were found to contain admixtures of either ground or whole wheat screenings.

Ground mixed feeds are exempt from the provisions of the State feeding stuff law, but in order to determine whether such materials are true to name 96 samples were examined. Of these 33 were considered suspicious from the fact that they contained more than 7 per cent crude fiber. Eighteen samples were believed to be adulterated since they had a crude fiber content of 9 per cent or more. From these figures the authors conclude "that 38 per cent of the samples of corn and oats sampled and analyzed in our laboratory during the past season were suspicious, and 24 per cent were in all probability adulterated. . . . The materials used for adulterating corn and oat feeds are low-grade refuse products like oat hulls, oat dust, crushed corncobs, corn bran, and mixed corn and oat feeds composed largely of such refuse materials. . . . These adulterations, and the sale of mixed corn and oat feeds as pure ground grains, form the most serious violation of our State feeding stuff law. Other adulterations that have been established during the past season are the admixture of ground or whole screenings to mill refuse feeds, oat feeds, and ground corn and oats, and of . . . ground corn pith to dried brewers' grains. Aside from the adulteration of the grain feeds, the situation in this State is not, on the whole, discouraging."

Concentrated feeding stuffs licensed for sale in Wisconsin, 1903, F. W. WOLL (*Wisconsin Sta. Bul. 99, pp. 3, 4, 6–8*).—The text of the State feeding stuff law is given and also a list of the concentrated feeds licensed for sale in the State together with figures showing their guaranteed protein and fat content.

The Wisconsin feeding stuff law (*Wisconsin Sta. Rpt. 1902, pp. 282–284*).—The text of the State feeding stuff law is quoted.

Food for live stock (*Jour. Jamaica Agr. Soc., 6 (1902), No. 11, pp. 435–439*).—The general principles of stock feeding are discussed and a number of rations made up of local feeding stuffs are suggested.

Barley chaff as a cattle feed, J. P. WAGNER (*Jour. Agr. Prat., n. ser., 5 (1903), No. 5, p. 153*).—On the basis of the nutritive material contained barley bran is said to be worth 50 cts. per 100 kg. as a feeding stuff. Brief notes regarding its use are given.

The chemical composition of the bottle-tree, J. C. BRÜNNICH and W. MAXWELL (*Queensland Agr. Jour., 11 (1902), No. 5, pp. 363–365*).—The pith of the bottle-tree (*Sterculia rupestris*) is suggested as a possible cattle feed in times of extreme drought. Proximates and ash analyses of this material are reported.

Concerning cacao shells, P. WELMANS (*Ztschr. Oeffentl. Chem., 7 (1901), pp. 491–500; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 23, pp. 1165–1168*).—A study of cacao shells with especial reference to the detection of this material when in finely ground form and used as an adulterant for powdered cacao.

Copra products at Marseille, R. P. SKINNER (*U. S. Consular Rpts., 70 (1902), No. 267, pp. 531–534*).—Considerable information is given regarding the manufacture of cocoanut butter and similar products made from cocoanut oil.

Crushed corncobs, F. B. GUTHRIE (*Agr. Gaz. New South Wales, 13 (1902), No. 10, p. 1065*).—The feeding value of ground corncobs is discussed and analyses of ground cobs and ground cob mixtures are given.

Effects of discriminate ringbarking, and the value of Kurrajong as a fodder tree, W. MACDONALD (*Agr. Gaz. New South Wales, 13 (1902), No. 2, pp. 1102–1104*).—The value of Kurrajong scrub (*Sterculia diversifolia*) for feeding purposes is discussed.

Molassecuit (*Louisiana Planter, 29 (1902), No. 1, p. 3*).—It is stated that this stock feed consists of 80 per cent molasses and 20 per cent of the fine cellular matter of sugar cane secured from bagasse. It is claimed that this material is dry and has an advantage over molasses, since it can be readily handled and shipped.

Variation in the composition of molasses feeds; composition and feeding value of brewers' grains, L. Grandeau (*Jour. Agr. Prat., n. ser., 5 (1903), pp. 37, 38*).—The author quotes and discusses the composition of a number of such feeding stuffs.

Poppies and poppy-seed cake, F. Mach (*Landw. Vers. Stat., 57 (1902), No. 5-6, pp. 419-459, pls. 3*).—The culture of poppies and the composition and feeding value of poppy seed and poppy-seed cake are discussed and proximate and ash analyses are reported. The author summarizes the results obtained by many previous investigators.

Sugar cane as a fodder for stock, F. B. Guthrie (*Agr. Gaz. New South Wales, 13 (1902), No. 10, p. 1054*).—Analyses are reported of whole sugar cane, sugar-cane tops, and a mixture of equal parts of the two. These analyses follow:

Analyses of sugar-cane feeding stuffs.

	Water.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Whole sugar cane	71.0	0.6	0.4	18.0	9.5	0.5
Sugar-cane tops	75.2	1.7	.6	13.6	7.4	1.5
Whole cane and tops 1:1	73.1	1.1	.5	15.8	8.5	1.0

On the protein compounds in whale-flesh meal, A. Kavli (*Norsk Landmandsblad, 21 (1902), No. 24, pp. 281, 282*).—Analyses of 24 samples.

Succus entericus and pancreatic digestion, E. Pozerski (*Thesis, Paris, 1902; abs. in British Med. Jour., 1902, No. 2179, Epit., p. 52*).—From experiments with rabbits and dogs the following conclusions regarding the effect of the intestinal juice upon the amylolytic action of the pancreatic and salivary secretions were drawn: "There exists in the succus entericus a substance which renders active (or aids the action of) the amylose ferment of the pancreatic secretion. This substance has a similar adjuvant action on the amylose of the saliva and of *Aspergillus niger*. Maceration of lymphoid glands, especially the mesenteric glands and spleen, and of leucocytes gives rise to a substance which has similar activity in aiding the amylolytic ferment of the pancreatic juice. This substance has nothing in common with the trypsin of the pancreatic juice. It is not itself a diastatic ferment. The adjuvant action of this substance is probably due to the presence in it of certain salts and proteid materials, whose precise composition, however, has not yet been ascertained. This substance is present in the succus entericus; but as to its exact origin (whether secreted by the mucosa or derived from leucocytes which have passed into the alimentary canal in the processes of digestion) there is still some doubt."

Animal fluids and tissues in their physical relations. VI, Electrical conductivity and lowering of the freezing point as indicators of protein cleavage, M. Oker-Blom (*Skand. Arch. Physiol., 13 (1902), No. 6, pp. 359-374*).—Experiments are reported and discussed.

DAIRY FARMING—DAIRYING.

Investigation in milk production, T. L. Haecker (*Minnesota Sta. Bul. 79, pp. 89-148*).—Several lines of work are reported as follows:

The food of maintenance (pp. 89-97).—This subject was studied in a preliminary test made in 1894 with 2 cows, in a second test made in 1896-97 with 2 cows, and in a third test made in 1897-98 with 3 cows. On an average daily ration of 11.38 lbs. of dry matter containing 0.63 lb. of digestible protein, 5.75 lbs. of carbohydrates, and

0.12 lb. of ether extract, dry, barren cows made an average daily gain of 0.23 lb. The deduction is made that a ration of 11.5 lbs. of dry matter containing 0.6 lb. of digestible protein, 6 lbs of carbohydrates, and 0.1 lb. of ether extract is sufficient for maintenance of dry, barren cows at rest in stall. It is tentatively suggested that for cows at work in a dairy with ordinary good care and comfortable quarters the following allowance of digestible nutrients per 1,000 lbs. live weight be made for maintenance: Protein 0.7 lb., carbohydrates 7 lbs., and ether extract 0.1 lb., which is somewhat lower than the Wolff standard.

Nutrient requirements (pp. 98–112).—The experiments reported in Bulletin 71 of the station (E. S. R., 13, p. 683) and discussed with reference to protein requirements are here discussed with reference to the other nutrients as well. It is believed that the Lehmann factors for milk production prescribe more nutrients than are needed, that the quality of milk is quite as important a factor as the quantity of milk in formulating a feeding standard, and that heifers require more nutrients per pound of milk yielded than do mature cows. Tables are given which show the calculated nutrients in excess of that required for maintenance as given above used by mature cows and by heifers in the production of 1 lb. of milk testing a given percentage of fat, and the use of the tables is explained. Some of the figures are given in the following table:

Nutrients required by mature cows and by heifers for the production of one pound of milk.

	Mature cows.			Heifers.		
	Protein.	Carbohydrates.	Ether extract.	Protein.	Carbohydrates.	Ether extract.
Fat content of milk:	*Pound.*	*Pound.*	*Pound.*	*Pound.*	*Pound.*	*Pound.*
2.5 per cent	0.0362	0.164	0.0124	0.0380	0.188	0.0127
3 per cent	.0397	.181	.0136	.0443	.217	.0148
3.5 per cent	.0432	.197	.0147	.0505	.245	.0170
4 per cent	.0467	.214	.0159	.0568	.273	.0192
4.5 per cent	.0502	.230	.0170	.0630	.302	.0213
5 per cent	.0537	.247	.0182	.0693	.330	.0235
5.5 per cent	.0572	.263	.0194	.0755	.358	.0256
6 per cent	.0607	.280	.0206	.0818	.387	.0278

Protein requirements (pp. 113–127).—In a feeding experiment from November 11, 1901, to February 17, 1902, the following grain rations were fed to different lots of 6 cows each: (1) Equal parts of corn, bran, and gluten meal; (2) four parts each of corn and bran and one part of gluten meal; and (3) equal parts of corn, barley, and oats. The nutritive ratios were, respectively, 1:6.3, 1:7.7, and 1:9.7. Data for 8 consecutive weeks are given, from which the following conclusions in substance are drawn: "Rations having a nutritive ratio of 1:7.7 and 1:9.7, respectively, were as effective in the production of milk, butter fat, and milk solids as was the one having a nutritive ratio of 1:6.3. The protein required in milk production depends upon the quantity and quality of milk yielded. In the production of butter fat actually more but relatively less protein and other nutrients were required to a pound of butter fat with cows giving milk containing a high per cent of fat than with those giving milk containing a low per cent of fat. In the production of milk solids less nutrients were required to a pound with cows giving milk having a low per cent of butter fat than with cows giving milk having a higher per cent of fat."

Influence of stage of lactation on nutrient requirements (pp. 128–148).—Data are given showing the live weight, nutrients consumed, and milk, fat, and solids produced by each of 8 cows at different stages of lactation. Averages are also given for 15 cows during the first 9 weeks of lactation. The author makes the following deductions from the data presented:

"(1) During the early stages of the period of lactation cows lose rapidly in body weight—of 15 cows the average decrease per cow the first week was 49 lbs.—and during 56 days there was a daily average loss per cow of 2 lbs.

"(2) During the time when the decrease in body weight takes place cows yield dairy product in excess of the amount provided for by the food consumed, the excess of yield depending upon the rate of loss in weight of body. In some instances it is more than twice the amount provided for by the available nutriment.

"(3) The excess yield of dairy products gradually decreases until about the eleventh week, when an equilibrium generally obtains between the nutriment consumed and dairy products yielded, though in this respect cows differ; those of a pronounced dairy temperament taking less time, while those not strong in dairy temperament decrease more slowly in weight and require more time to reach normal work in milk production. Before such equilibrium is reached the body fat and possibly other substances contribute directly or indirectly to product.

"(4) The normal net nutriment requirements to a pound of butter fat is approximately 6.25 lbs., with a slight increase by cows yielding milk containing a low per cent of butter fat, and less with cows giving milk containing a high per cent of butter fat.

"(5) The normal net nutriment requirements to a pound of milk solids yielded is approximately 2.4 lbs., with a slight increase with cows yielding milk rich in butter fat and less with cows giving milk containing a low per cent of butter fat.

"(6) When the daily nutriment available for product and the products yielded daily are reduced to an approximate common value of energy, it is found that it requires about 1.75 lbs. of available nutriment to 1 lb. of product; that is, of the available nutriment, 43 per cent is expended in energy and 57 per cent is returned in the milk solids.

"(7) The daily yield of butter fat in excess of the nutriment supply, by virtue of an average daily loss per cow of 2 lbs. in body weight, was 0.283 lb., being a sacrifice of 7 lbs. in body weight to 1 lb. of butter fat yielded in excess of that provided for in the ration.

"(8) When the normal working condition of body weight is reached the nutriment required to a pound of butter fat and a pound of milk solids remains quite constant for an indefinite time under proper management."

A study of rations fed to milch cows in Connecticut, C. S. Phelps (*Connecticut Storrs Sta. Rpt. 1901, pp. 81–104*).—This work was begun in 1892 and has been reported upon from time to time (E. S. R., 13, p. 983). The objects have been to study the rations in use by farmers, to offer suggestions for the improvement of such rations, and to study the economy of feeding according to the yields of butter fat. During the 7 years previous to 1900, 37 studies were made, the results of which showed that too little attention has been paid to the proportion of protein used in feeding cows and too little effort has been made to feed according to the productiveness of cows. The work during 1900 and 1901 related to feeding according to the yields of butter fat, and is summarized by the author as follows:

"Four herds of cows were studied during the winter of 1900–1901. Two tests were made with each herd, covering periods of 12 days each in all except one test, which lasted 11 days.

"In the first test the entire herd was fed the ration in use by the dairyman, which usually was nearly the same for all cows of the herd. The amount of protein in the ration varied for the different herds from 1.75 to 2.40 lbs. per cow per day.

"In the second test the ration was varied according to the yields of butter fat produced in the first test. Two grain mixtures were used in this test; the first was included with the coarse fodders in what was called a basal ration, which was planned to contain about the same amount of protein as the average ration used in the first test; the second grain mixture, called a protein mixture, was chiefly made up of concentrated nitrogenous grain feeds, combined in such proportions as to furnish in the different cases 0.2 and 0.3 lb. of protein for each pound of the mixture. The plan of feeding in this test was to use the basal ration uniformly for all cows in the test and to add to this certain quantities of the protein mixture, varying for the different cows according to the average daily amount of butter fat they had produced in the first test."

The following table summarizes the result of each test:

Original and suggested rations fed to dairy cows.

	Average weight of cows.	Digestible protein.	Fuel value.	Nutritive ratio.	Total cost of ration.	Cost, less value of manure.	Daily yield of milk.	Daily yield of butter.	Total cost of 100 lbs. milk.	Total cost of 1 lb. butter.
Herd T:	*Lbs.*	*Lbs.*	*Calories.*		*Cents.*	*Cents.*	*Lbs.*	*Lbs.*		*Cents.*
First test	750	1.75	27,960	1:7.6	17.0	10.3	14.1	0.87	$1.21	19.5
Second test	750	1.90	24,860	1:6.0	17.1	10.1	14.7	.94	1.16	18.2
Herd U:										
First test	725	1.77	29,480	1:8.0	18.6	11.8	17.4	.98	1.07	19.0
Second test	725	2.44	29,610	1:5.5	19.9	11.5	18.0	1.10	1.10	18.1
Herd V:										
First test	800	2.19	35,140	1:7.6	21.7	13.0	19.4	1.04	1.12	20.9
Second test	800	2.34	30,320	1:6.0	19.6	11.4	19.1	1.06	1.03	18.5
Herd W:										
First test	900	2.40	30,990	1:5.9	20.1	11.8	19.6	1.03	1.03	19.5
Second test	900	2.74	29,710	1:4.8	20.0	11.1	18.1	1.00	1.10	20.0

"The cost of the average ration was less in the second test for 1 herd, practically the same for 2 herds, and was more in the second test for 1 herd. The average food cost of producing 100 lbs. of milk was less in the second test for 2 herds and was more for the other 2 herds. The average food cost of 1 lb. of butter was less in the cases of 3 herds and more in the case of 1 herd in the second tests.

"When the food cost of producing milk and butter is compared by groups of cows fed different amounts of protein in the first and second tests, it appears that the cost of producing 1 lb. of butter was less in nearly all groups in the second test than in the first, when the amount of protein in the second test was not more than about 2.6 lbs. per day. The gains in yields and profit in the second tests seem to be most marked when the results from the use of from 1.9 to 2.4 lbs. of protein are compared with those from the use of smaller quantities.

"The economy of feeding according to the yields of milk or butter fat depends much upon what yields are taken as a basis. In these experiments, where about 2 lbs. of protein was used as a basal ration for a yield of 0.5 lb. of butter fat daily, and the protein was increased from 0.20 to 0.27 lb. for an increase of from 0.15 to 0.20 lb. of butter fat, the food cost of production was generally less, until the protein reached about 2.6 lbs., than where uniform rations with smaller amounts of protein were used. The number of experiments is too small and the variations in the amounts of protein fed are too limited to be used as a basis for judging the amounts of protein needed for a given yield of butter fat; but the indications are that the amount of protein fed should be between 1.9 and 2.5 lbs., varying according to the productiveness of the cow."

Value of sugar beets as a food for milch cows, G. W. BERGLUND (*Nord. Mejeri Tidn., 18 (1903), No. 4, pp. 43, 44*).—Sugar beets were fed to 32 cows, in quantities ranging for the 5 different groups from 10 to 25 kg. per head daily. The grain feed given was 1 kg. malt sprouts, 1 kg. wheat bran, ½ kg. each of peanut meal and sunflower-seed cake, ¼ kg. rape-seed cake, with straw and hay as roughage. The experimental periods lasted from 19 to 23 days. The highest returns were obtained with cows fed 20 kg. of beets per day, those fed 10 kg. coming second. The author concludes that sugar beets are an excellent food for milch cows; they increase the milk flow perceptibly without affecting the fat content of the milk, and may be advantageously used to take the place, in part, of starchy concentrated foods in the feeding of milch cows.—F. W. WOLL.

Official tests of dairy cows, 1901-2, F. W. Woll (*Wisconsin Sta. Rpt. 1902, pp. 107–127*).—Tabulated data are given for tests of 196 pure-bred cows representing Holstein, Guernsey, Jersey, and Red-Polled breeds and belonging to 19 different breeders. Many of the cows were tested more than once. The rules governing the tests are included. The work of testing pure-bred cows was begun by the station in 1894. The average production of the Holstein cows in 7 days was as follows: Cows 5 years old and over (55 tests), 401.5 lbs. of milk and 14.275 lbs. of fat; cows 4 years old (29 tests), 380.6 lbs. of milk and 13.412 lbs. of fat; cows 3 years old (44 tests), 370.2 lbs. of milk and 13.253 lbs. of fat; cows 2 years old (64 tests), 282.1 lbs. of milk and 9.851 lbs. of fat.

Investigations of methods of milking, F. W. Woll (*Wisconsin Sta. Rpt. 1902, pp. 75–106, pls. 2*).—This is a résumé of Bulletin 96 of the station (E. S. R., 14, p. 694).

Efficiency of a covered pail in excluding filth and bacteria from milk, W. A. Stocking, jr. (*Connecticut Storrs Sta. Rpt. 1901, pp. 105–121, fig. 1*).—Comparative determinations were made of the amount of dirt in milk drawn into an open pail and into an ordinary pail provided with a closely fitting cover, having on one side a funnel 4 in. in diameter, across the bottom of which was a fine wire gauze. When in use a few layers of cheese cloth were held in place above the wire gauze by means of a second funnel fitting loosely inside the first. The milking was done under favorable conditions as regards cleanliness. Of several methods tested for determining the amount of dirt in the milk, the following was found most satisfactory:

"The sample of milk was heated to 90° F., and was then run through a separator the bowl of which had also been warmed to 90° by running through it warm filtered water, the amount and temperature of the water necessary for the purpose having been previously ascertained. The milk was poured directly from the sampling flask into the receiving cup of the separator, thus avoiding any error that might arise from pouring it through the supply tank. The sampling flask was then washed with warm filtered water, and this was also poured into the bowl. After that filtered water at 90° was run through in sufficient quantity to wash out the greater part of the milk from the dirt residue. If the bowl was running at the proper speed before the milk was poured in, and if the speed was maintained till the overflow had entirely ceased, there would be left in the bowl a watery liquid containing the dirt from the sample and a small percentage of milk; but when the work was properly done there would be no fat left in the bowl to interfere with the subsequent filtering. The contents of the bowl, which consisted of the dirt residue and small quantities of milk, were then collected in a small dish by means of repeated washing, and these were filtered through a filter paper which had previously been dried in a desiccator and weighed. In order to free the residue on the filter paper from all trace of milk it was necessary to wash it for several hours with warm filtered water. After washing until the filtrate showed no traces of cloudiness the paper with the dirt was again dried in the desiccator and weighed, and the weight of the dirt computed."

On an average for 15 tests 0.1103 gm. of dried insoluble dirt was removed from 1 liter of milk drawn into the open pail, and 0.0408 gm. from 1 liter drawn into the covered pail, showing that 63 per cent of dirt was excluded by the cover. Milk drawn into an open pail was compared with milk drawn under similar conditions and strained immediately after milking. Straining removed 46.6 per cent of the dirt. Studies were also made of the germ content and keeping qualities of the milk obtained by the different methods, with the results summarized by the author as follows:

"In the fresh milk from the covered pail the total number of bacteria was about 71 per cent, and the number of acid bacteria about 59 per cent of those in the fresh milk from the open pail. In the fresh strained milk the total number of bacteria was 89 per cent and the number of acid bacteria 83 per cent of those in the milk not strained.

"After the milk had stood for 50 hours at constant temperature of 70° F. the average for the total number of bacteria was larger in the milk from the covered pail than in that from the open pail; while the average for the acid producing species was larger in the latter than in the former. In the strained milk both the total number and the number of acid bacteria were larger than in the milk not strained.

"The milk from the covered pail curdled sooner than that from the open pail, the average difference being about 7 hours; likewise the strained milk curdled sooner than the milk not strained, the average difference being also about 7 hours. This fact, however, is of but little moment since any of these samples had they been kept at the usual temperatures for handling milk would have remained sweet longer than milk is usually kept.

"The results of these tests would seem to indicate that the covered pail is more efficient for the production of pure milk than straining milk drawn into an open pail. It is quite evident also that to keep the dirt out of the milk in the first place is much better than straining it out after the milking. A considerable portion of the dirt dissolves quickly in the warm milk and thus introduces a contamination that can not be strained out."

The comparative growth of different species of bacteria in normal milk, H. W. Conn and W. M. Esten (*Connecticut Storrs Sta. Rpt. 1901, pp. 13-80*).—The importance of a better knowledge of the development of different species of bacteria in milk under normal conditions is briefly discussed, the method of investigation used by the authors is described, and the following 3 series of experiments are reported upon in detail and summarized: (1) The comparative growth of different species of bacteria in milk at 20° C.; (2) the effect of icing milk upon the development of bacteria; and (3) the comparative growth of bacteria in milk at temperatures of 20 and 13°.

The method of study has been noted briefly from another source (E. S. R., 14, p. 907). The culture medium is prepared in practically the same way as ordinary gelatin, with the addition of litmus and milk sugar. The sample of milk to be tested is properly diluted and plate cultures are made. The colonies are counted after several days to determine the total number and the number of different kinds. The necessity of keeping the plates 3 to 5 days or longer is considered the most serious fault of the method, as under certain conditions complete liquefaction takes place before the colonies can be differentiated. The authors have been able to differentiate about 30 species of bacteria by their method. The forms most commonly found in milk a few hours old were *Bacillus acidi lactici*, *B. acidi lactici II*, *B. lactis ærogenes* (from which *B. coli communis* was not differentiated), several allied species designated the Streptococcus group, rapid and slow liquefying bacteria, and 2 species of Sarcina. While the differentiation is considered only approximate, the authors are convinced that the error is not very great.

The 3 series of experiments as a whole showed little regularity in the comparative development of the different species of bacteria in milk. The number of bacteria at any stage was found to be more dependent upon temperature than upon the original contamination. As regards the development of the bacteria, 2 periods were recognized, the first, in which the number of bacteria was less than 10 million per cubic centimeter, lasting from 24 to 50 hours according as the temperature was 20 or 13°, and the second, in which the number of bacteria was above 10 million, lasting from the end of the first period until the time of curdling. Some of the changes which occurred during the first period may be noted as follows: The number of bacteria in milk was not increased, but was frequently reduced during the first few hours after milking. At 20° most of the species began to increase in absolute numbers after the first 6 hours, *B. acidi lactici* increased uniformly, the other lactic acid bacteria were irregular in their development, the Streptococcus group always increased, the liquefying bacteria practically always increased in absolute and sometimes in relative numbers, the species of Sarcina developed but little, and the miscellaneous species decreased slightly during the first period. At 13° the original period of no growth was increased, the number of bacteria at the end of 50 hours being no greater than that in milk at 20° after 18 hours. The rapid development of bacteria after 40 hours was most frequently due to the growth of the Streptococcus group, rather than to the lactic-acid bacteria. The development of the miscellaneous species was favored by the lower temperature. The preliminary icing of milk for a period of 15 hours greatly reduced the number of bacteria, the number present at the time of curdling being much less than in samples not previously iced. The preliminary icing favored the development of a number of miscellaneous species, but delayed the development of the *B. acidi lactici.*

During the second period the lactic-acid bacteria, especially *B. acidi lactici,* increased with marvelous rapidity, their number sometimes reaching 99 per cent of the total number of bacteria. The other species decreased in both relative and absolute numbers. The liquefying bacteria frequently disappeared entirely.

The presence of tubercle bacilli in market milk and butter, PAWLOWSKY (*Compt. Rend. 10. Cong. Internat. Hyg. et Démogr., Paris, 1900, pp. 187-189*).—As determined by inoculation experiments with guinea pigs tubercle bacilli were present in 1 out of 51 samples of milk and in 1 out of 54 samples of butter examined. A bacillus resembling the tubercle bacillus was also present in 3 of the samples of butter.

A new method of sterilizing milk, C. C. L. BUDDE (*Nord. Mejeri Tidn., 18* (*1903*), *No. 5, pp. 65, 66*).—The method depends on the action of nascent oxygen on the micro-organisms in milk at a temperature above 40° C.; it consists in the addition of a small quantity of hydrogen peroxid to the milk (0.9 gm. per liter) and heating rapidly to 50°; or hydrogen peroxid may be added to milk previously heated to about 50°, so that it will contain about 0.35 gm. of hydrogen peroxid to the liter; in either case the subsequent heating of the milk is continued for 5 to 6 hours. An excess of hydrogen peroxid may be rendered innocuous by the addition of a sterile infusion of common yeast. The author has applied for a patent for the method in European countries.—F. W. WOLL.

Sterilization of milk by means of peroxid of hydrogen, C. BARTHEL (*Nord. Mejeri Tidn., 18* (*1903*), *No. 11, pp. 139-141*).—The author discusses the results of the investigations of Heidenhain, Henrietta Chick, J. Huwart, and A. Rosam on the use of hydrogen peroxid for the sterilization of milk and reports a number of experiments which he conducted on this point, with special reference to the Budde method of milk sterilization (noted above). The amount of undecomposed hydrogen peroxid in the milk was determined in the following manner: ½ cc. of dilute sulphuric acid (1:3) was added to 25 cc. of milk, and to 5 cc. of the clear filtrate 10 cc. of a 10 per cent potassium iodid solution and 5 cc. of sulphuric acid (1:3) were added. The free iodin was then titrated back with a tenth normal thiosulphate solution, after having been left standing in a dark place for 4 hours and frequently shaken. It was found that an excess of only 0.05 gm. of hydrogen peroxid per liter of milk is plainly noticeable by taste. If only a trace or no undecomposed peroxid is present the milk will remain sweet for a longer or shorter time, according to the temperature at which the milk is kept, but after some time, when the bacteria recover from the effects of the peroxid, decomposition of the milk will begin. The practicability of the Budde method is questioned by the author because the amount of peroxid required for different kinds of milk can only be determined by frequent exact chemical titrations, and also because the commercial 3 per cent peroxid, partly on account of its impurities and partly on account of its dilution, can not be used in practical work, while the chemically pure peroxid is too expensive to be used under such conditions.

The author finds that milk to which minimum quantities of peroxid (e. g., 0.1 gm. per liter) are added after heating to from 45 to 50° C. for some minutes, will react toward the Storch paraphenylenediamine test like milk which has been pasteurized at 80° C. or above.—F. W. WOLL.

Observations on the use of acid tests for milk and cream, E. H. FARRINGTON (*Wisconsin Sta. Rpt. 1902, pp. 128–135*).—The results of several tests are reported. It was found that standard alkaline solutions used in the determination of acidity in milk and cream were unaffected by freezing and thawing, provided all the ice was melted before the liquid was used. While the dry alkaline tablets keep indefinitely, the solutions prepared from them were found to lose in strength after keeping for about 1 week. When a solution was allowed to remain in the burette over night the loss in strength was noticeable. The curd and the whey in the same sample, even after standing for 8 days, were shown to neutralize different amounts of alkali, emphasizing the importance of thorough mixing before testing. Determinations of the acidity in samples of cream containing from 25 to 50 per cent of fat and kept under uniform conditions showed maximum degrees of acidity, varying with the fat content. The maximum amount of acid developed in skim milk was 0.78 per cent, in 25 per cent cream 0.6 per cent, and in 40 per cent cream 0.5 per cent. Only 0.11 per cent of acid developed in cream containing 50 per cent of fat before the sample was too thick to draw into the pipette.

A modified cream-test bottle, E. H. FARRINGTON (*Wisconsin Sta. Rpt. 1902, pp. 147–149, fig. 1*).—The author condemns a tendency on the part of manufacturers to increase the diameter of the necks of cream-test bottles, permitting in some cases the entire graduation from 0 to 30 per cent to occupy a space of only 2 in. in length. In the modified test bottle designed by the author and here figured and described the capacity of the bulb is decreased from about 55 cc. to about 45 cc., which is considered large enough when the quantity of cream is 18 gm. The diameter of the neck is decreased so that the graduated scale occupies about twice the usual length, permitting readings of ¼ per cent. The bottle is of the usual length of a milk-test bottle.

The composition of frozen milk, E. H. FARRINGTON (*Wisconsin Sta. Rpt. 1902, pp. 136, 137*).—Analyses were made of 3 lots of milk before freezing, of the liquid portion of samples containing different amounts of ice, and of the melted ice. When about 25 per cent of the sample was frozen the fat content of the liquid portion was about 0.5 per cent higher and of the ice about 1 per cent lower than that of the original sample. When from 40 to 50 per cent of the milk was frozen there was no great difference in the fat content of the liquid and iced portions. The casein, ash, and milk sugar were not separated very much by freezing.

Ekenberg's "desiccator" (*Nord. Mejeri Tidn., 18 (1903), No. 8, pp. 99, 100*).—A description is given of the apparatus constructed by M. Ekenberg for the manufacture of the "milk flour" invented by him (E. S. R., 14, p. 804). An analysis of the product shows its composition to be as follows: Albuminoids 36 per cent, carbohydrates 49 per cent, fat 1 per cent, mineral matter 7.5 per cent, and moisture 6.5 per cent.—F. W. WOLL.

Swedish butter exhibits, 1901, N. ENGSTRÖM (*Meddel. K. Landtbr. Styr. [Sweden], 1902, No. 79, pp. 47*).—During the year 359 creameries took part in the exhibits. In all, 1,374 tubs of butter were exhibited. The average water content of the butter was 13.3 per cent, the range being from 9.7 to 20.4 per cent. Of the total number of creameries 327 furnished butter made from pasteurized cream for all and 13 creameries for some of the exhibits in which they participated, while 8 did not pasteurize the cream, and 11 failed to give information on this point. Pure-culture starters were used throughout the year by 43.4 per cent of the creameries and buttermilk starters by 37.6 per cent. Sweet-cream butter was made by 7 per cent and radiator butter by 3.9 per cent of the creameries. A marked beneficial effect of the pasteurization of the cream, as regards the quality of the butter made from it, is apparent from the scores presented in the report.

The average fat content of 871 samples of separator skim milk examined during the year was 0.12 per cent, the figures for the different separators ranging between 0.07 per cent and 0.23 per cent. Of the 556 samples of buttermilk tested, that from pasteurized cream contained, on the average, 0.49 per cent of fat, and that from raw cream 0.50 per cent; the lower and upper limits obtained in the former case being 0.23 and 1.67 per cent and in the latter case 0.31 and 0.83 per cent. The average loss of fat in the skim milk was 0.104 lb. per 100 lbs. of milk, and in the buttermilk 0.049 lb., the total figures in the case of pasteurized butter being 0.143 lb. and in the case of raw-cream butter 0.169.—F. W. WOLL.

Water content of butter, L. F. ROSENGREN (*Nord. Mejeri Tidn., 18 (1903), No. 3, pp. 37, 38*).—The following conclusions are drawn from the results of investigations of the relation of churning conditions to the water content of butter: A low water content may be obtained by various methods of procedure—by lowering the churning temperature, by washing the butter well with cold water and allowing the washings to drain thoroughly, by salting before working, and by postponing the second working in until the butter has become hardened in the refrigerator room (preferably until the next morning). Numerous analyses are given of butter made under different conditions as to time and methods of working, salting, etc.—F. W. WOLL.

The composition of process or renovated butter, C. A. CRAMPTON (*Jour. Amer. Chem. Soc., 25 (1903), No. 4, pp. 358–366*).—Previously noted (E. S. R., 14, p. 523).

Conditions affecting the character of butter fat, T. E. THORPE (*Jour. Bd. Agr. [London], 9 (1903), No. 4, pp. 447–460*).—This is a general discussion of the subject, several methods of analysis being described and investigations by Werenskiold in Norway, Boggild and Stein in Denmark, and others being reviewed.

Pasteurized cream butter, E. H. FARRINGTON and J. H. GODFREY (*Wisconsin Sta. Rpt. 1902, pp. 138–142*).—Pasteurization of cream in butter making, which is not commonly done in American creameries at the present time, is considered as theoretically a promising way of overcoming one of the most common faults in creamery butter, namely, the lack of uniformity in quality. In experiments along this line from 1,000 to 1,500 lbs. of sweet cream was mixed and divided into 3 lots, one of which was cooled to 50° F. and churned sweet; one heated to 185 to 190° in a continuous pasteurizer, cooled immediately to 54°, and then ripened at 75° with a pure culture; and one ripened at 70 to 75° with the same starter, without previous pasteurization. The experiment was repeated a number of times during the period from April to July. Notes are given on the butter made from the sweet cream, pasteurized cream, and raw cream. "The sweet-cream butter was at its best when made. It did not improve with age, but rapidly deteriorated, becoming decidedly off-flavor in 3 weeks' time. The pasteurized-cream butter was much better than the sweet-cream butter, and its flavor improved or became more pronounced until it was 5 weeks old. After about 3 weeks the flavor was fully as good as the fresh raw-cream butter and during this time very little, if any, objection could be made to it." The raw-cream butter was also at its best when first made. The body of the pasteurized butter was not defective at any time, which is attributed to the method of heating and cooling used.

Difficulties in the way of drawing conclusions from experiments in butter making when based on one judge's scores, E. H. FARRINGTON (*Wisconsin Sta. Rpt. 1902, pp. 143–146*).—The scores of the judges in the above experiments are given and commented upon. "The differences in scores suggest that when important matters are at stake, the opinions of a number of judges working independently or in sets of three judges should be obtained, each tribunal making its report independently of the other, and none of them knowing anything about the history of the butter scored."

Influence of cold curing on the quality of Cheddar cheese, S. M. BABCOCK, H. L. RUSSELL, A. VIVIAN, and U. S. BAER (*Wisconsin Sta. Rpt. 1902, pp. 150–164*).—This is an account of a continuation of the investigations described in the last report of the station (E. S. R., 13, p. 988). The results of the work as a whole were included in Bulletin 94 of the station (E. S. R., 14, p. 490), in which the advantages and disadvantages of cold curing were considered at length.

Influence of temperatures approximating 60° F. on the development of flavor in cold-cured cheese, S. M. BABCOCK, H. L. RUSSELL, A. VIVIAN, and U. S. BAER (*Wisconsin Sta. Rpt. 1902, pp. 165–173*).—Examinations of cheese which had been thoroughly ripened in cold storage were made at frequent intervals during 1 year to determine the effect of subsequent exposures to high temperatures. The results are presented in detail and discussed and the following conclusions are drawn:

"(1) The mild flavors which characterize cold-cured cheese may be intensified by subsequent exposure to somewhat higher temperatures (approximately 60° F.). The flavor so produced does not partake of the sharp tang usually found in old cheese cured at high temperatures. Care must be taken not to have this temperature too high nor maintained too long, as in a partially cured cheese this subsequent enhancement in flavor rapidly occurs.

"(2) In order to hold the desirable flavors for the longest possible time, and so lengthen the commercial 'life' of the cheese, the same should be returned to lower temperatures for storage as soon as the desired flavor is reached. Under such conditions further development is stopped and such cheese may be held unimpaired for many months.

"(3) With cheese made from first-class milks the rate of ripening can be hastened by a brief preliminary exposure to a higher temperature (not much exceeding 60° F.), but the improvement in the product both as to nature and keeping quality of same when cured at low temperatures makes it preferable to employ low temperatures for the bulk of the curing. Where consolidated cold-curing stations are established, transportation of the green product from the factories requires a brief period (a few days) during which time no damage is likely to occur. With imperfect milks there is always danger in curing even for a brief period at temperatures normally employed. The cold-curing system is more likely to give favorable results with such milks."

Influence of varying quantities of rennet on cold-cured cheese, S. M. BABCOCK, H. L. RUSSELL, A. VIVIAN, and U. S. BAER (*Wisconsin Sta. Rpt. 1902, pp. 174–179, fig. 1*).—In earlier investigations at the station (E. S. R., 13, p. 87), it was shown that the ripening of cheese may be hastened by the use of additional quantities of rennet. In several of the cold-curing experiments referred to above advantage has been taken of this fact to hasten the ripening of the cheese. Three, six, and nine oz. of rennet per 1,000 lbs. of milk have been used. The results are considered as showing that at 32° and 40° F. 9 oz. of rennet can be used with safety. "However, the cheese made with 6 oz. of rennet were also quite as good and ripened up nearly as rapidly. They also had a tendency to hold the mild flavor better than the 9 oz. goods, and it is our judgment that the use of 6 oz. under cold-curing conditions is perhaps preferable to a higher amount. These experiments thoroughly demonstrate that larger than normal quantities can be used with advantage, in that they give a more buttery and softer texture and also hasten the ripening course."

Conditions affecting the development of white specks in cold-cured cheese, S. M. BABCOCK, H. L. RUSSELL, A. VIVIAN, and U. S. BAER (*Wisconsin Sta. Rpt. 1902, pp. 180–183*).—In the last report of the station (E. S. R., 13, p. 989), the almost invariable occurrence of small white specks in cold-cured cheese was reported. The specks did not apparently affect the flavor or texture of the cheese in any way. Conditions affecting their formation were investigated, with the following results:

"The chief factors determining the formation of white specks in Cheddar cheese seem to be that of temperature and salt. Low temperatures favor very much the production of these specks. Rarely do they appear at 60° F. except where other conditions are peculiarly favorable for their production. The addition of salt tends to prevent their formation under all conditions. Also they are not so apparent when increased quantities of rennet are used. They are especially abundant in skim cheese, but do not appear in very rich cheese even at low temperatures. In sweet-curd cheese no specks were found at any temperature."

Cheese experiments with yeast cultures according to O. Johan-Olsen's method, S. J. BENTERUD and O. IVERSEN (*Aarsber. Offent. Foranstalt. Landbr. Fremme, 1901, pt. 3, pp. 84*).—Pure cultures of yeasts obtained from Dutch clove cheese, Gouda, Gorgonzola, and Norwegian Old Cheese (Gammelost), according to the method of Dr. O. Johan-Olsen, were used in the manufacture of such cheeses on a commercial scale. Sixty-five experiments in the manufacture of Dutch clove cheese were made, at two different factories, a total quantity of 30,392 kg. of separator skim milk being used in the experiments. Two or three control cheeses were made in each experiment, in a different room from that in which the pure-culture cheeses were made. The pure cultures were used both in connection with pasteurized and raw skim milk. The cheeses were kept for about 7 months before being scored. The average score for control cheeses made from raw milk was 8.5 points, and for experimental cheese, 10.3 points. In experiments where pure cultures were added to pasteurized milk and control cheeses were made from raw milk the scores were: Control cheese, 9.6 points; experimental cheese, 9.5 points. When pasteurized milk was used for all cheeses, the scores averaged 11.3 points for control cheese and experimental cheese alike. The average scores for all cheeses made in the three series was 9.3 points for control and 10.2 points for experimental cheese. The results show that good cheese can be made from pasteurized milk by the method of pure-yeast cultures. The most uniform results were obtained with raw milk without the use of pure cultures, but the quality of the cheese was in general somewhat improved by the use of the proper pure culture, whether pasteurized or raw milk was used for the manufacture of the cheese.

In the manufacture of Gouda cheese 56 experiments were made, in which 25,852 kg. of new milk and 6,638 kg. of skim milk were used. The average fat content of the milk was 2.76 per cent. The age of the cheese at the time of scoring was about 6 months at one of the factories where the experiments were conducted and about 4 months at the other factory. The following average scores were obtained: Control cheese from raw milk, 10.1 points; experimental cheese from raw milk, 9 points; control cheese from pasteurized milk, 10.4 points; experimental cheese from pasteurized milk, 10.6 points; where pasteurized milk was used for the experimental cheese and raw milk for the control, the average scores were, 9.1 points for the control and 11.1 points for the experimental cheese. The average score was 0.9 point higher in favor of pure cultures. The greatest benefit was derived from the use of pasteurized milk in the manufacture of the cheese.

Gorgonzola cheese was made in 56 experiments with 16,852 kg. milk of an average fat content of 3.34 per cent. The average scores for all experiments when the cheeses were about 7 months old were 11.9 points for the control cheese and 10.7 for the experimental cheese. No advantage was obtained by the use of the pure-yeast cultures in the manufacture of this cheese, either in the case of raw or pasteurized milk. The pure-culture cheese made from pasteurized milk also scored lower than the control cheese made from raw milk. The experiments in the manufacture of Gammelost gave a similar result; the yeast cultures apparently failed to exert any beneficial influence as regards the quality of the cheese.

Accounts of experiments on the use of calcium chlorid and grated cheese in the manufacture of pasteurized-milk cheese and on the influence of pasteurization on the yield and quality of Primost cheese are also presented in the report.—F. W. WOLL.

Notes for cheese makers, J. A. RUDDICK (*Canada Dept. Agr., Comr.'s Branch, Dairy Division Bul. 9, n. ser., pp. 7*).—This consists of 53 suggestions relating to cheese making.

Cheese making on the farm, H. E. Alvord (*U. S. Dept. Agr., Farmers' Bul. 166, pp. 16, figs. 3*).—Directions compiled from various sources are given for the manufacture on the farm of several varieties of cheese.

Modern dairy science and practice, L. L. Van Slyke (*Pennsylvania Dept. Agr. Bul. 104, pp. 127, pls. 4, figs. 8*).—This bulletin is a treatise on dairying in its restricted sense of a manufacturing industry. Chapters are devoted to the chemistry of milk, contamination of milk, preparation of milk for market, cream, butter making, the relation of milk to yield of butter, preliminaries of cheese making, making Cheddar cheese, curing cheese, qualities of cheese, the relations of milk to cheese, methods of testing milk and its products, and special dairy products.

The statistics of the dairy, H. E. Alvord (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 50–62*).—This is a discussion of the condition of the dairy industry in the United States as shown by the Twelfth Census.

VETERINARY SCIENCE AND PRACTICE.

Modern theories of bacterial immunity, H. C. Ernst (*Boston: Journal Medical Research, 1903, pp. 123*).—This volume contains an abstract of a series of lectures delivered on this subject at the Harvard Medical School. The author presents a glossary of terms relating to immunity, in which attempt is made to indicate so far as possible the various meanings ascribed to these terms by different writers. The main body of the volume is occupied with a careful examination of the theories of Metchnikoff and Ehrlich. As a result of the author's study of these 2 theories it is concluded that they are not so contradictory as is generally supposed. According to both theories, 2 substances are required in active immunity, viz, immune body and complement. Metchnikoff insists that these substances remain in the phagocytes, while Ehrlich and his followers claim that they exist in the blood serum.

A review of current theories regarding immunity, J. Ritchie (*Jour. Hyg.* [*Cambridge*], *2 (1902), Nos. 2, pp. 214–250; 3, pp. 251–285; 4, pp. 452–464*).—The author presents a critical review of this subject, in connection with a bibliography of 106 titles. The chief theories which have been proposed in explanation of the phenomena of immunity are discussed in detail. The author believes that the study of immunity as at present prosecuted leads to results of great biological significance. The results may be considered as forming a contribution to an understanding of the complex processes of metabolism.

Investigations on the antibodies of spores, W. Defalle (*Ann. Inst. Pasteur, 16 (1902), No. 10, pp. 756–774*).—The experiments reported in this paper were made for the purpose of determining the influence of bacterial spores upon animal sera. The experimental animals chosen by the author were dogs and guinea pigs, and the bacterial organisms used were *Bacillus mycoides*, *B. mesentericus vulgatus*, *B. subtilis*, *B. alvei*, the first anthrax vaccine, and anthrax bacilli attenuated by carbolic acid. The result of the author's numerous experiments with the spores of these organisms indicate that the injection of bacterial spores into animals is followed by the production of antibodies (agglutinins and sensibilizing substances). The injection of the spores of molds, however, does not produce this special power in the serum. The development of antibodies is certainly the result of the resorption of the spores as such and not of their germination in the organism, since it is shown that the results are the same, whether the spores are injected in a dead or living condition. The antibodies produced by the spores are also active toward the spores of other organisms. In the formation of antibodies in animals spores exercise an action very different from that of the bacteria themselves. Living or slightly attenuated bacilli produce agglutinating and sensibilizing properties in the serum, while bacilli heated to a temperature of 115° C. produce only agglutinins. Spores, on the other hand, when heated to a temperature of 115° C. produce both agglutinins and sensibilizing substances in the animal sera. The antibodies thus formed in animal sera do not furnish reliable means for the recognition of the species of spores.

Immunization against immune serum, E. W. A. Walker (*Jour. Path. and Bact., 8 (1902), No. 1, pp. 34–51*).—The experiments reported in this paper were chiefly concerned with the change induced in bacteria by their growth in immune serum, and the change in the susceptibility of guinea pigs to specific infection due to previous treatment with increasing doses of serum. The immune serum used was the antityphoid serum of Tavel. It was found during the author's experiments that bacteria may be immunized against their immune serum, and may thus be increased in virulence, and become less readily agglutinable. An immune serum in which the corresponding bacillus has been cultivated is thereby rendered less agglutinative and less effective against the bacillus. It was also found that animals may be immunized against immune sera. They are thereby rendered less capable of being protected by that serum, but their susceptibility to the bacterial organism is not increased. Agglutinins are considered true antibodies. The immune body of the same bacterial organism is held to be not identical in different animals, but exhibits especial characters for each species.

Note on toxic and antitoxic action in vitro and in corpore, E. F. Bashford (*Jour. Path. and Bact., 8 (1902), No. 1, pp. 52–69*).—The author's experiments on the protective properties of sera were made largely with reference to the effect of these sera upon corrosive sublimate, saponin, solanin, digitalin, snake venom, ricin, tetanolysin, etc. The experiments were conducted in 2 series, one in vitro and the other in experimental animals, and the results of the 2 series are compared. The author combats the idea that there is any artificially increased protective action in vitro, of the serum of animals immunized against any of these toxic agents, due merely to increase in constituents normally present. The apparent similarity of the reactions obtained in vitro and in experimental animals is briefly discussed by the author, and it is suggested that the protective action of normal serum in vitro be called pseudo-antitoxic in cases where the toxin is incapable of causing the production of the corresponding antitoxin.

Investigations concerning the protective and curative action of anthrax serum obtained from the dog, F. Sanfelice (*Centbl. Bakt. u. Par., 1. Abt., 33 (1902), No. 1, Orig., pp. 61–71*).—While dogs have generally been considered as nearly or quite immune to ordinary infection with anthrax, the author found during numerous experiments that a certain number of dogs were readily infected, while others proved to be quite immune. After repeatedly inoculating dogs with attenuated cultures of anthrax at first and using cultures of greatly increasing virulence, it was found possible to secure a serum from dogs treated in this way which would protect experimental animals against fatal infection with virulent cultures of anthrax.

The destruction of toxins by peroxids and oxydases of animal and vegetable origin, N. Sieber (*Arch. Sci. Biol. [St. Petersburg], 9 (1902), No. 2, pp. 151–170*).—During the extensive investigations undertaken by the author on this subject it was found that calcium dioxid and oxygenated water would destroy the toxins of diphtheria and tetanus. Oxydases of animal and vegetable origin neutralize the toxins of these diseases. The destructive action of oxydases toward toxins manifests itself not only in vitro, but also in the body of the experimental animal, provided the mixture of the toxin and oxydase are injected subcutaneously. The oxydases are capable of exercising their action on small doses of toxins, even when these substances are injected into the animal at different points. It was found that the destruction of toxin by emulsions containing oxydases takes place only when the emulsions give the color reactions which would be characteristic for the oxydases.

The bactericidal action of certain aromatic substances, H. Marx (*Centbl. Bakt. u. Par., 1. Abt., 33 (1902), No. 1, Orig., pp. 74–76*).—Experiments were tried to determine the effect of turpentine oil and nitrobenzol on anthrax bacillus and

Staphylococcus pyogenes aureus. It was found that turpentine oil killed anthrax bacilli when applied in a concentration of 1 to 100 for a period of 60 minutes, while the staphylococci were killed by a concentration of 1 to 10 for the same period. Nitrobenzol, even in a concentration of 1 to 10, did not kill anthrax bacilli or staphylococci within a period of 24 hours.

Morphological changes in the blood during hemolysis, Y. Fukuhara (*Beitr. Path. Anat. u. Allg. Path., 32 (1902), No. 2, pp. 266–275, pl. 1*).—The author studied the microscopic changes in the structure of the red blood corpuscles under the influence of substances which cause hemolysis. The animals from which material was obtained included pigeons, guinea pigs, rabbits, and carp. For producing hemolysis the author used weak solutions of soda (0.2 per cent) and various stains, such as crystal-violet, safranin, and methylene blue. The results of these investigations may be summarized as follows: Small portions of the red blood corpuscles are constricted off during the process of hemolysis; this phenomenon, however, is not especially characteristic of hemolysis, since it also occurs in the coagulation of the blood. The nuclei are set free and the coloring matter of the red corpuscles is gradually dissolved. After the red blood corpuscles lose their hemoglobin, they greatly resemble leucocytes and are distinguished from the latter chiefly by the fact that they become etiolated more rapidly.

The red blood corpuscles and infection, M. Dominici (*Arch. Med. Exper. et Anat. Path., Paris, 1. ser., 14 (1902), No. 6, pp. 681–728*).—An extensive series of experiments was undertaken for the purpose of determining certain details in the behavior of the red blood corpuscles during the progress of infectious diseases in man and animals. The chief purposes of the author were to study the diapedesis and destruction of the red blood corpuscles, the behavior and excessive production of nucleated red blood corpuscles in the bone marrow and in the spleen, and the parallel reactions of the red and white blood corpuscles. The work of other authors on this subject is critically discussed, in connection with bibliographical references. The author infected experimental animals with coli bacillus, typhoid bacillus, and other organisms. It was found that the production of nucleated blood corpuscles in rabbits took place quite rapidly in the peripheral blood vessels at the beginning of septicemic infection. The author was unable to observe any evidence of extensive destruction of the red blood corpuscles in such affections as icterus and hemorrhages. The spleen is believed to be the only organ in which the red blood corpuscles are actually destroyed.

Structure and function of wandering cells, phagocytes, and pus cells, R. Klemensiewicz (*Beitr. Path. Anat. u. Allg. Path., 32 (1902), No. 3, pp. 351–434, pls. 3*).—The investigations reported in this paper were undertaken for the purpose of explaining as far as possible the nature of leucocytes with polymorphous nuclei. The experimental animals were batrachia. The author found that the finely granulated leucocytes with polymorphous nuclei constitute a well-marked group of cells which occur not only as cells in the blood of the organs and larger vessels, but also as pus cells and phagocytes. The structure of the cytoplasm of these cells is characteristic and apparently constant. The author believes that all cells with polymorphus nuclei represent merely one kind of physiological structures which are not so strictly confined in function as are muscle or nerve cells. It is suggested as desirable that certain constant parts of these cells be distinguished by names, such as secretory apparatus, respiratory and excretory organs, motor organs, etc.

Infectiveness of milk of cows which have reacted to the tuberculin test, J. R. Mohler (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 44, pp. 93, pls. 2*).—As a result of the death of a number of cattle from rabies at the Government Asylum for the Insane, St. Elizabeth, D. C., post-mortem examinations were made when it was found that the herd was badly infected with tuberculosis. Twelve animals upon which post-mortem examinations were made were found to be extensively tuberculous. Notes are given on the history, care, and stabling of the herd. The animals were fed in the stable throughout the year. The herd consisting of 102 animals, was tested with tuberculin; of this number 76, or 74 per cent, gave a decided reaction; 10 of the animals which showed physical symptoms of tuberculosis also reacted to tuberculin, and of these 10, 5 were found to be unfit for food, while in the other the tuberculous alterations were confined to the lymphatic glands or were otherwise localized. The nonreacting animals were placed in a stable by themselves, after thorough disinfection of the premises, and the tuberculous herd was kept isolated and was cared for by separate attendants.

A series of experiments was made in testing the infectiveness of the milk of reacting animals by feeding and inoculation in guinea pigs. The literature of this subject is critically discussed by the author. In experiments made by the author a sample of milk was taken from each cow daily, the number of cows being 66. The milk was fed to guinea pigs and the centrifugalized cream was inoculated intraabdominally. Cover-glass preparations were also made from the sediment of both the milk and cream and were examined under the microscope after staining. The quantity of milk injected was from 1 to 3 cc. in each guinea pig. In a subsequent examination of the inoculated guinea pigs acid-proof bacteria other than tubercle bacilli were found in only 3 cases. Various other micro-organisms were found in connection with Moeller's grass bacillus. Among the 43 guinea pigs which were used as check animals in the experiments no case of tuberculosis developed. The author gives condensed statistics concerning each cow and the experiments made with her milk. From the feeding and inoculation experiments it was found that the milk of 9 different cows produced fatal tuberculosis when fed to guinea pigs, while the same result was obtained in 13 instances from intraabdominal injection. By combining the results from feeding and inoculation experiments it was found that 12 of the 56 reacting cows, or 21.4 per cent at one time or another gave milk which contained virulent tubercle bacilli. The virulence of the milk increased with the advancement of the disease. The asylum authorities decided to sell the reacting animals as soon as they became dry and thus gradually reduce the herd. After 6 months a second tuberculin test was made; of the 26 cows which were injected, 25 of which had failed to react in a previous test, 8 gave a decided reaction. A third injection 3 months later in 18 cows produced no reaction in any case. The author concludes from these experiments that the tubercle bacillus may be present in the milk of tuberculous cows without an affection of the udder, that tubercle bacilli may be excreted from such animals in sufficient numbers to produce fatal infection in experimental animals. It was found that the number of tubercle bacilli in the milk varies from day to day. The author recommends that "the milk of all cows which have reacted to the tuberculin test should be considered as suspicious and should be subjected to sterilization before using. Still better, tuberculous cows should not be used for general dairy purposes."

Human and bovine tuberculosis, N. RAW (*British Med. Jour., 1903, No. 2196, pp. 247, 248*).—During the past 5 years the author has had under his care 1,750 human patients suffering with various forms of pulmonary tuberculosis and 273 children affected with tabes mesenterica. Post-mortem examination and bacteriological studies were made on a large number of these cases and inoculation experiments were conducted with the material thus obtained. As a result of the author's studies it is concluded that there are 2 distinct varieties of tuberculosis which affect man, one produced by the human tubercle and the other by the bovine tubercle. It is believed that these 2 forms of tuberculosis, while separate and distinct, may both affect man, the true human tuberculosis being usually the pulmonary form and bovine tuberculosis occurring ordinarily as an affection of the mesenteric glands and the alimentary tract. It is believed by the author that true human tuberculosis is always transmitted from one person to another by infection, but that every effort should be put forth to stamp out tuberculosis in cattle, and that milk and tuberculous products should be sterilized before being eaten.

The transmissibility of human tuberculosis to cattle and goats, A. MOELLER (*Deut. Med. Wchnschr., 28 (1902), No. 40, pp. 718, 719*).—The author conducted a number of experiments, during which attempts were made to inoculate calves with human tubercle bacilli by way of the mouth, by intraperitoneal, subcutaneous, and intravenous injections, and by inhalation. Similar methods were used in attempts to inoculate goats. During these experiments it was found to be impossible to infect calves with tubercle bacilli of human origin by any method whatever. The same negative results were obtained from sputum or pure cultures of tubercle bacilli of human origin, whether administered intravenously or given by way of the mouth. Similarly, tubercle bacilli of human origin which had first been passed through goats failed to produce an infection in calves. It was found that enormous quantities of the bacilli could be fed to goats or be inoculated intraperitoneally without producing any infection.

Transmission of tuberculosis of man to cattle, J. FIBIGER and C. O. JENSEN (*Berlin. Klin. Wchnschr., 39 (1902), No. 38, pp. 881–886*).—Detailed notes are given on the clinical history and post-mortem examination of human tuberculous patients in which there was apparently good evidence of a primary infection of the alimentary tract. Among 12 children who died of tuberculosis and upon whom post-mortem examinations were made a diagnosis was reached indicating primary alimentary tuberculosis in 2 cases. Inoculation experiments were made on calves and cows with material obtained from some of these cases. It was found that the bacilli thus obtained were pathogenic for calves, being in some cases exceedingly virulent. In all, 5 cases of tuberculosis in man furnished material for inoculation of calves, and a great difference in the virulence of the bacilli was noted, ranging from completely nonvirulent to very virulent forms. It was observed that the virulence of the bacilli obtained from these human tuberculous patients varied according to the age of the patients, being gradually weakened in the older patients. The possibility is suggested of an attenuating influence of the human organism which manifests itself in gradually weakening the virulence of tubercle bacilli.

The transmissibility of bovine tuberculosis to man, KÖHLER (*Deut. Med. Wchnschr., 28 (1902), No. 45, pp. 800–804*).—The recent literature relating to this controversy is critically discussed by the author. It is argued that a majority of cases of tuberculosis in man are due to infection from other human beings rather than from the products of tuberculous animals. The statistics quoted by the author are believed to furnish proof of this proposition. It is not thought desirable, however, to abandon all the safeguards in protecting man from possible infection from animals, but it is urged that the chief attention be given to preventing the spread of tuberculosis from one human being to another.

Tuberculous infection through the alimentary tract, A. HELLER (*Deut. Med. Wchnschr., 28 (1902), No. 39, pp. 696, 697*).—Brief notes are given on a number of cases in which man has apparently become infected with tuberculous virus of bovine origin, and statistics are presented showing the proportion of such cases. Detailed notes are given on one case of intestinal tuberculosis in a 13-year-old boy, which was believed to be unexplainable except on the basis of infection through tuberculous products. The author states, however, that this case is not unexceptionable, since we must consider that tubercle bacilli of human origin may readily be ingested into the alimentary tract along with filth which may be present on the hands, especially of children.

Inoculation tuberculosis, O. LASSAR (*Deut. Med. Wchnschr., 28 (1902), No. 40, pp. 716–718*).—Among 108,000 patients which came under the attention of the author during the past 10 years, 34 are believed by him to be undoubted cases of inoculation tuberculosis. These cases were chiefly veterinarians, meat stampers, butchers, and meat dealers. Details are given concerning the history of a few of these cases. While among the patients which were examined by the author less than 0.03 per cent were affected with cutaneous tuberculosis, this is believed nevertheless to indicate the comparatively serious danger from infection by bovine tuberculosis in skin wounds.

Pearl disease and human tuberculosis, M. WOLFF (*Deut. Med. Wchnschr., 28* (*1902*), *No. 32, pp. 566–570*).—This article is of a controversial nature. The author argues from the results of experiments and from observations that bovine tuberculosis may be transmitted to man. Detailed notes are given on a case of primary alimentary tuberculosis of man which can only be explained as the result of infection from tuberculous animal products. A number of experiments were made in inoculating animals with material obtained from this and other cases. As a result of these inoculations and post-mortem examinations it is argued that tuberculosis may appear in man and cattle under the same form, and that the 2 diseases are identical. It is urged, therefore, that all measures which have been adopted for preventing the spread of tuberculosis by means of animal products should be rigidly adhered to.

What is pearl disease? J. ORTH (*Berlin. Klin. Wchnschr., 39* (*1902*), *No. 34, pp. 793–798*).—Brief notes are given on the different views which have been held regarding the nature of pearl disease and its relationship to human tuberculosis. A number of experiments were conducted in which experimental animals were inoculated with tuberculous material of human origin and the material obtained from these animals was then used in testing the susceptibility of calves, hogs, and goats. Three of each of these animals were used in the experiments. Among the calves, 2 showed only local changes while 1 exhibited considerable evidence of generalized tuberculosis, including swelling of the mesenteric, portal, and cardiac lymphatic glands. Similar results were obtained with the hogs, of which 2 were only slightly infected, while 1 exhibited considerable tuberculous alterations. All three of the goats became affected with generalized tuberculosis. The author concludes, therefore, that tubercle bacilli of human origin may be so increased in virulence as to become pathogenic for domesticated animals.

Tuberculosis of the transversely striated muscles, S. SALTYKOW (*Centbl. Allg. Path. u. Path. Anat., 13* (*1902*), *No. 18, pp. 715–718*).—A brief review is given of the literature relating to the subject of the behavior of the musculature toward infection with tuberculosis. The author made a number of experiments on rabbits. The animals were inoculated intravenously with tubercle baccilli and the tubercles which developed as a result of this infection were carefully studied with regard to histological details. The muscles were examined at various periods ranging from 2 to 25 days after the inoculation. Detailed notes are given on the histological features and changes observed in the muscles. The tubercles appeared to arise first in the walls of the blood vessels, and were at first formed by the cells of these walls. Later, muscle and other tissues seemed to be concerned in the formation of the tubercles. It was not until 12 days after inoculation that any proliferation of muscle cells could be observed in the neighborhood of the forming tubercles.

Combating bovine tuberculosis in Norway, O. MALM (*Tidsskr. Norske Landbr., 9* (*1902*), *No. 10, pp. 455–467*).—An appropriation was made for the study of the diagnostic value of tuberculin in 1891, and in 1895 systematic work on the problem of bovine tuberculosis in Norway was begun. Extensive tuberculin tests were made between this date and 1901 and the results of these tests were summarized. It was found that the number of infected animals varied from 3.3 to 8.4 per cent. The smallest infestation was found in younger animals, while the more extensive infestation was observed in animals 5 years or more old. It is believed that a successful fight can be waged against the bovine tuberculosis in Norway by means of thorough tuberculin tests and through the cooperation of veterinarians, progressive stock farmers, and officials.—F. W. WOLL.

The question of acclimation to tuberculin, Bartels (*Deut. Thierärztl. Wchnschr., 10 (1902), No. 29, pp. 285, 286*).—Among 768 steers which had been tested with tuberculin 6 to 7 days previously, 105 reacted, and 97 of these were found to be tuberculous upon post-mortem examination. The author believes that the number of cases which fail to react to tuberculin when tested shortly after a previous injection is much less than has been supposed by some authors. It is believed that where circumstances render it impossible to wait longer in making the test, the second test may be made within 6 to 8 days after the first; the author recommends, however, in all cases where time is not such an important factor that the second test should be made 3 to 4 weeks after the first.

Contribution to von Behring's method of immunizing cattle against tuberculosis, Melde (*Berlin. Thierärztl. Wchnschr., 1902, No. 40, pp. 593–597*).—The author presents an outline of the immunization method with which von Behring has been experimenting. The method has been extended and is being put into practice on a larger scale. Experiments are being conducted to further perfect methods for securing tuberculin of known strength. In all, about 3,000 cattle have been tested with the Marburg tuberculin, and it has been found that all animals endured this test without any injurious consequences. Various races and ages of cattle have been tested by the tuberculin and have been subjected to vaccination according to von Behring's method. Up to the present time 175 cattle have been immunized in this manner, and as a rule cattle have been chosen for these experiments from tuberculous herds, so that the immunized animals may be exposed to tuberculous ones. It is believed by the author that the method promises to become exceedingly valuable and further reports on the progress of the experiments are promised.

Experimental investigations on the action of dead tubercle bacilli, C. Sternberg (*Centbl. Allg. Path. u. Path. Anat., 13 (1902), No. 19, pp. 753–778*).—The literature of this subject is critically reviewed by the author. Extensive series of experiments were undertaken for the purpose of determining the effect of the presence of dead tubercle bacilli in animal tissues. Tubercle bacilli were obtained from several sources for use in these experiments, and the material used was previously subjected to different processes. The material came from glycerin-agar cultures, bouillon cultures, and pulverized tubercle bacilli. Later a series of experiments was made to determine whether the toxic principles of tubercle bacilli could be readily extracted by ordinary means so as to render dead tubercle bacilli harmless toward animal tissue. Another series of experiments was undertaken to determine the possibility of immunizing animals by means of tuberculin. As a result of these experiments it was found that dead tubercle bacilli in the animal body were capable of producing essentially the same alterations as living bacilli, although to a less extent. The dead bacilli were found to be capable of killing experimental animals and producing typical tubercles with epithelioid and giant cells. Dead tubercle bacilli could be demonstrated in the animal body for a long time after inoculation and were readily stainable. It is believed, therefore, that the active principle of tubercle bacillus is inherent in the bacterial body and is not removed by persistent and repeated sterilization in living steam, but may be extracted by means of alcohol, ether, and chloroform. It was found that the pathogenic action of tubercle bacillus distinguishes it from all other bacilli otherwise resembling it. It is believed that the necrosis of the lungs in pulmonary tuberculosis of animals and man is partly due to the effect of large quantities of dead tubercle bacilli in such situations. It was found that rabbits could be immunized against the effect of dead tubercle bacilli by repeated injections of tuberculin.

The development of the treatment of parturient paresis during the last five years, J. Schmidt (*Berlin. Thierärztl. Wchnschr., 1902, No. 33, pp. 497–503, fig. 1*).—Since the potassic iodid treatment for parturient paresis was introduced by the author it has been extensively tried in different countries and some of the results of practical experience are brought together in the present article. The author has experimented with pumps for introducing air into the udder in connection with his original treatment. In 140 cases the average length of time between the beginning of treatment and recovery was $6\frac{2}{3}$ hours. It is believed that the use of air hastens recovery in almost all cases. An elaborate discussion is given on the subject of the etiology of this disease. Potassium iodid is known to possess a pronounced antitoxic action and the author believes that the effect of this treatment must be largely due to local action of the chemical in the udder.

On the treatment of parturient paresis, J. Schmidt (*Maanedsskr. Dyrlaeger, 14 (1902), No. 5, pp. 192–212*).—The author gives a résumé of the literature relating to the treatment of this disease by means of potassic iodid. Notes are also given on the injection of various other substances into the udder, such as warm water, iodin-potassic-iodid, sodium iodid, potassium bromid, etc. It is believed that the most important modification of the potassic iodid treatment which has thus far been proposed is the use of sterilized air. This may be pumped into the udder alone or in combination with and following the potassic-iodid treatment. The chief advantage of the air treatment is that cows recover the normal flow of milk in a comparatively short time.—F. W. WOLL.

Treatment of parturient paresis by iodid of potash, Nevermann (*Berlin. Thierärztl. Wchnschr., 1902, No. 27, pp. 402, 403*).—The Schmidt treatment for this disease has given satisfactory results as a rule but the effectiveness of the treatment has been attributed to various factors. It has recently been found that the treatment is rendered more rapidly effective by forcing considerable quantities of pure air into the udder in connection with the infusion of iodid of potash. The author recommends the introduction of air into the udder after the infusion in cases of parturient paresis.

A new treatment of parturient paresis, E. Thierry (*Jour. Agricole [Paris], 14 (1903), No. 154, pp. 9–15*).—Notes are given on the good results recently obtained from the use of filtered air in connection with potassium iodid as a treatment for parturient paresis. It is believed that this disease will in most cases yield to treatment more rapidly when filtered air is used in addition to potassium iodid.

Parturient paresis before parturition and the theory and treatment of this disease by means of filtered air, A. Teetz (*Berlin. Thierärztl. Wchnschr., 1902, No. 32, pp. 474–476*).—The author describes a number of cases of this disease which occurred before parturition. Some of the cases were observed before the placenta was loosened, and some of them exhibited an intermittent course. The author believes that parturient paresis is due to excessive anemia of the brain, and that this condition is explained by the unusual flow of blood from other parts of the body to the udder at the beginning of the period of lactation. It is suggested that the introduction of air and the infusion of iodid of potash into the udder might have the effect of forcing out some of the blood from this organ, and thus relieving the cerebral anemia to a certain extent.

Subacute parturient paresis and its treatment with air, A. Teetz (*Berlin. Thierärztl. Wchnschr., 1902, No. 43, pp. 644, 645*).—The technique of introducing air into the udder is briefly described. In one case of parturient paresis air was pumped into all 4 teats of a cow affected with this disease. Considerable improvement in the condition of the animal was noted within $\frac{1}{4}$ of an hour, and within 5 hours she was able to get up. A rapid recovery followed this treatment.

Simple treatment of parturient paresis, Evers (*Berlin. Thierärztl. Wchnschr., 1902, No. 32, p. 473, fig. 1*).—The author describes an apparatus devised for introducing pure air into the udder of cows affected with parturient paresis. The apparatus consists of a rubber bulb, a metallic cylinder in which cotton batting may be introduced for filtering impurities out of the air, and a suitable smooth needle connected with rubber tubing.

A new instrument for use in the treatment of parturient paresis, Nevermann (*Berlin. Thierärztl. Wchnschr., 1902, No. 45, pp. 677, 678, fig. 1*).—A business firm in Hanover has devised an instrument which may be used in pumping pure filtered air into the udder of cows affected with this disease, and another simple apparatus has been devised by the same firm for administering the potassium iodid. According to the author the instrument is exceedingly convenient and enables the operator to apply the treatment rapidly.

Foot-and-mouth disease and sulphate of iron, A. Bouchaud (*Jour. Agr. Prat., n. ser., 5 (1903), No. 5, pp. 147–152*).—Notes are given on the symptoms and the pathological anatomy of this disease. A number of experiments have been made in the treatment of foot-and-mouth disease with external applications of sulphate of iron. The author repeated these experiments with excellent results. It was found that the spread of the disease could be more effectively checked by this treatment than by any other method. The affected animals were sprayed with a 20 per cent solution of sulphate of iron. The mouth was washed with a 10 per cent solution of the same chemical, and in acute cases a 5 per cent solution was administered internally, to the amount of 2 liters per day for adult animals and 1 liter of a 2 per cent solution for calves. Complete recovery was brought about and the disease was prevented from spreading.

Foot-and-mouth disease and its treatment, G. d'Utra (*Bol. Agr. São Paulo, 3. ser., 1902, No. 6, pp. 370–374*).—Notes are given on the symptoms and etiology of this disease. The author discusses also the various disinfectants and antiseptic substances which have been used in treating foot-and-mouth disease. Treatment by injections of corrosive sublimate are said to be ineffective.

Study of the diseases included under the name actinomycosis, J. Lignières and J. Spitz (*Bol. Sec. Fomento [Mexico], 2 (1902), Nos. 3, I, pp. 186–200; 4, I, pp. 243–263*).—The authors describe the general symptoms and pathological anatomy of actinomycosis. The disease appears under a number of forms, according to the organs which are chiefly affected. The principal forms are those which affect the skin, tongue, pharynx, glands, udder, viscera, and bones. During 1900 and 1901 the disease prevailed to an unusual extent and with great virulence in Argentina. Notes are given on the toxin produced by the pathogenic organism and on the etiology, treatment and serum therapy of this disease. A bacterial organism was found as the cause of the disease, and the term actinobacillosis is used by the authors.

The action of iodin upon actinomyces, Schmaltz (*Berlin. Thierärztl. Wchnschr., 1902, No. 27, pp. 401, 402*).—Attention is called to the difference of opinion which has prevailed between the physicians and veterinarians regarding the effectiveness of iodin treatment in actinomycosis. Brief notes are given on the literature relating to this subject, and an account is presented of an infection with actinomycosis which was suffered by the author. The iodin treatment in this case was ineffective, but a cure was finally brought about by surgical means.

Vaccination for pleuro-pneumonia, Leistikow (*Berlin. Thierärztl. Wchnschr., 1902, No. 29, pp. 437–441*).—The author discusses the great importance of this disease to veterinarians and cattle raisers. Notes are given on the method of vaccination which has proved quite effective in preventing the spread of this disease. The effects of this vaccination has not been scientifically determined. It is purely an empirical method. Vaccination, however, is considered as exceedingly valuable, and it has contributed greatly to the restriction of an outbreak of this disease.

A study of the bacteriology of pyelonephritis of cattle, Liénaux and Zwaenepoel (*Ann. Méd. Vét., 51 (1902), No. 9–10, pp. 500–507*).—The previous literature on this subject is briefly discussed. The authors conducted experiments with the bacillus of Preisz for the purpose of determining whether this organism was the specific cause of pyelonephritis. During the experiments it was found that the disease was not produced by this organism—merely a local inflammation resulted, without the characteristic symptoms of pyelonephritis.

The therapeutic use of tannoform in intestinal diseases of calves, Schünhoff (*Berlin. Thierärztl. Wchnschr., 1902, No. 45, pp. 678, 679*).—In the author's practice tannoform combined with calomel has given excellent results in the treatment of diarrhea and other intestinal disturbances in calves. The mixture is prepared so as to contain 1 part of calomel to 100 parts of tannoform.

The treatment of green diarrhea of calves, G. Carle (*Jour. Agr. Prat., n. ser., 5 (1903), No. 4, p. 109*).—Considerable success has been had in treating certain intestinal disturbances of children with gelatin. The effectiveness of this treatment is supposed to depend on the power of gelatin to protect the walls of the stomach and intestines against the harmful effects of certain bacteria and toxic products. In the treatment of diarrhea in calves promising results have been obtained by this method. Further experiments will be made.

Coccidiosis of sheep, and the parasitic organism, G. Moussu and G. Marotel (*Arch. Parasit., 6 (1902), No. 1, pp. 82–98, figs. 10*).—The authors describe in considerable detail the morphological characters of the protozoan organism which causes coccidiosis. Notes are also given on the pathological anatomy of this disease. The organism in question is often found in sheep also infested with palisade worms, and the lesions caused by the protozoan parasite are frequently attributed to the palisade worms. The organism of coccidiosis is believed by the authors to differ from *Coccidium zürni* and other related species of this genus. It is described as new, under the name *Coccidium faurei.*

Some pig diseases (*Jour. Jamaica Agr. Soc., 7 (1903), No. 1, pp. 22, 23*).—Brief notes on hog cholera and swine plague.

Swine erysipelas, M. Tempel (*Deut. Thierärztl. Wchnschr., 10 (1902), No. 52, p. 493*).—The author reports finding endocarditis as the immediate cause of death in hogs which had completely recovered from urticaria. It is believed, therefore, that urticaria belongs etiologically with swine erysipelas and that valvular endocarditis may appear in young hogs within 8 weeks after recovery from a case of swine erysipelas.

Recent results in combating swine plague, Schreiber (*Berlin. Thierärztl. Wchnschr., 1902, No. 48, pp. 749–755*).—The history of the development of methods for obtaining polyvalent sera in the treatment of infectious swine diseases is presented in considerable detail. The article is largely of a controversial nature. It is argued that any serum, in order to possess polyvalent action, must be calculated to operate not only against bacteria and other toxins, but also against local toxins formed in the animal tissues during the progress of the disease.

A pyogenic micro-organism in the hog, W. Grips (*Inaug. Diss., Univ. Giessen [1902], pp. 33*).—The author found fibrous deposits and abscesses in the peritoneum and serous lining of the thorax of hogs. In these abscesses a bacillus was found which is described as new, under the name *B. pyogenes suis.* The suppuration processes show a strong tendency to encapsulation. The pus is of a thick consistency without disagreeable odor and of a greenish color, and the bacillus which is considered as a cause of the suppuration is not always found alone, but is frequently associated with other bacteria. The organism is pathogenic for rabbits and mice when injected in comparatively large quantities. It gains entrance to hogs through various skin wounds, through the air passages and mucous membranes of the mouth and pharynx.

Septicemic brown neck of hogs, Graffunder and Schreiber (*Deut. Thierärztl. Wchnschr., 10 (1902) No. 50, pp. 471–473*).—The author describes an outbreak of a peculiar septicemic disease among pigs 6 to 8 months old. These pigs were allowed to run in woodland pasture. The symptoms were disturbances of the general condition, disinclination to move, reddening and swelling of the mucous membranes of the head, salivation, excessive swelling of the neck, especially in the region of the larnyx, and coughing. From post-mortem examination it was found that extensive series of infiltration had taken place in the musculature of the head and neck and as far back as the chest. The submaxillary and retropharyngeal lymphatic glands were enormously swollen. Ovoid bacteria which stained in a bipolar manner were found in streak cultures made from material obtained from these cases. These organisms were first suspected of being anthrax bacilli. It was later found, however, that the hogs had eaten the carcass of a steer which probably died of rinderpest. The author believes that the bacilli found in the hogs and which closely resemble the necrosis bacillus, probably made their way into the hogs in connection with the meat of the diseased steer. Brief notes are given on other cases of septicemic infection in hogs and other animals for the purpose of comparing known examples with the cases which came under the authors' attention.

On the behavior of the lymphatic apparatus in intestinal ulcerations in hogs, SEILER (*Deut. Thierärztl. Wchnschr., 10 (1902), Nos. 36, pp. 345–347; 37, pp. 353–355; 38, pp. 361–364, figs. 2*).—The literature of this subject is critically discussed. Special attention is given to an account of the behavior of the lymphatic system in cases of intestinal ulceration in hogs due to the presence of *Œsophagostomum venulosum* and as a result of swine plague and hog cholera. A considerable part of the author's work consisted in a study of a series of sections made through such ulcers and preserved and stained by various methods. A hyperplasia and excessive accumulation of white blood corpuscles in the neighborhood of these ulcers were observed in most cases of infestation by the palisade worms. The various stages in the formation of intestinal ulcers in cases of swine plague and hog cholera are described in detail.

Glanders, R. HOTTINGER (*Bol. Agr. São Paulo, 3. ser., 1902, No. 7, pp. 435–437*).—Brief notes on the post-mortem findings in 4 cases of glanders, together with a discussion of the diagnosis and etiology of this disease and notes on the use of mallein.

Tsetse fly disease in Togo, West Africa, H. ZIEMANN (*Berlin. Klin. Wchnschr., 39 (1902), No. 40, pp. 930–936*).—The author presents a general account of the etiology of this disease, together with notes on the life history of the blood parasite.

The so-called Borna horse disease, ENDERS (*Berlin. Thierärztl. Wchnschr., 1902, No. 44, pp. 653–658*).—Notes are given on the etiology, pathogenesis, symptoms, complications, sequelæ, and treatment of this disease.

Scratches or grease heel in horses, N. S. MAYO (*Industrialist, 29 (1903), No. 19, p. 301*).—Notes are given on the symptoms of this disease and on the frequency of its occurrence in horses. The treatment recommended consists in cleanly surroundings, poulticing affected parts, and the use of antiseptic ointments.

Mammary botryomycosis in the horse, P. UNTERHÖSSEL (*Berlin. Thierärztl. Wchnschr., 1902, No. 32, pp. 476, 477, figs. 2*).—This disease occurs chiefly in horses, while cattle and hogs appear to be only slightly susceptible to it. Brief notes are given on a number of cases which are reported in the literature on this subject, and a detailed history is presented of one case which occurred in the udder, with fatal results.

The origin of aneurysma verminosum equi, A. STICKER (*Deut. Thierärztl. Wchnschr., 10 (1902), No. 28, pp. 274–276*).—A number of cases of aneurism in horses caused by the presence of *Sclerostomum bidentatum* were examined by the author with special reference to determining the pathological histology of this disease. It was found that the middle coat of the wall of the blood vessels was chiefly affected, and not the inner coat. A number of cases of this disease were investigated and detailed notes are given on the histogenesis of the aneurisms.

A study of the morphology of the blood of the horse, S. H. BURNETT (*Amer. Vet. Rev., 26 (1902), No. 4, pp. 311–325, figs. 10*).—The objects of the investigation reported in this thesis were to determine the structure and condition of the blood of healthy horses and of horses which are suffering from various diseases. Notes were given on the technique employed in this investigation and on the size, appearance, and relative proportion of red corpuscles and 5 varieties of leucocytes which were observed, viz, lymphocytes, large mononuclear leucocytes, polynuclear leucocytes, eosinophilous and mast cells. The variations in the number of these elements in different diseases are presented in tabular form.

Observations on rabies in the district of Habelschwerdt, C. Wittlinger (*Berlin. Thierärztl. Wchnschr., 1902, No. 30, pp. 449–453*).—A brief historical account is given of rabies in this district and notes are presented on the cases which have been observed in man and animals. A copy is given of the laws which are in force in this district for preventing the spread of the disease.

Antirabies vaccinations in St. Petersburg, V. Kraiouchkine (*Arch. Sci. Biol. [St. Petersburg], 9 (1902), No. 3, pp. 337–342*).—Statistical notes are given on the number of persons bitten by presumably rabid dogs and other animals, and on the results of antirabies vaccinations. Notes are also presented on the number of animals suspected of being affected with rabies. The mortality among patients treated by the Pasteur method was 0.18 per cent.

Vaccination of dogs for distemper, H. Meyer (*Berlin. Thierärztl. Wchnschr., 1902, No. 45, p. 678*).—According to the author the antidistemper serum manufactured by the Jenner Institute in London has given excellent results in his practice, in preventing the development of distemper in young dogs.

Alopecia areata pigmentosa in dogs, V. S. Trofimov (*Arch. Vet. Nauk, St. Petersburg, 32 (1902), No. 11, pp. 921–930, pls. 5*).—Detailed notes are given on the etiology and pathological histology of this disease.

The action of ticks upon animal blood, P. Grützner (*Deut. Med. Wchnschr., 28 (1902), No. 31, pp. 555, 556*).—A study was made of the changes undergone by the blood of dogs in the body of *Ixodes ricinus.* It was found that the oxygen is removed from the arterial blood and that the red blood corpuscles are completely dissolved, thus setting free the coloring matter.

The tapeworms of ruminants, N. Kholodkovski (*Arch. Parasit., 6 (1902), No. 1, pp. 145–148, pl. 1, fig. 1*).—Brief anatomical and descriptive notes on certain species of tapeworms which infest ruminants.

Observations on fowl plague, Künnemann (*Deut. Thierärztl. Wchnschr., 10 (1902), Nos. 43, pp. 413–415; 44, pp. 421–424*).—Opportunity was had by the author to study a number of outbreaks of fowl plague. It appears that the disease has now been observed in a number of different localities in Germany, and in some of these outbreaks there is no evidence of importation of the fowls from Italy or other localities where the disease was previously known to exist. The symptoms are not very uniform, but the course of the disease is almost always exceedingly short. Death occurred in the majority of cases after 3 or 4 days. Frequently the comb and wattles exhibited a bluish red color after death. Usually an exudate was observed in the body cavity, and the vital organs in almost all cases were affected with more or less serious alterations. The author found it impossible to isolate any microorganism which could be considered as the pathogenic cause of the disease. This plague is believed to be identical with the disease previously described as cyanolophia. Pigeons were found to be immune. Transmission experiments with ducks also gave negative results. White mice, guinea pigs, and rabbits proved refractory. Chickens, however, are susceptible to inoculation and to infection by way of the alimentary tract. The virus is destroyed by decomposition within a short time, provided the carcasses of affected fowls are opened. In intact carcasses, however, the virus remains virulent for at least 28 days. The virus is only moderately resistant to heat and is readily destroyed by carbolic acid or corrosive sublimate. The author successfully disinfected poultry houses by the use of milk of lime.

Serum therapy in fowl cholera, WILLERDING (*Deut. Thierärztl. Wchnschr., 10 (1902), No. 50, pp. 473, 474*).—The author conducted a number of experiments for the purpose of testing the value of the Landsberg Septicidin and the fowl cholera serum of Jess and Piorkowski. Neither of these sera was found to have any noticeable effect in protecting healthy fowls against infection from fowl cholera or increasing the resistance of birds which were already infected.

The chicken mite, G. W. HERRICK (*Mississippi Sta. Bul. 78, pp. 13, figs. 4*).—The most favorable conditions for the rapid multiplication of the chicken mite are filth and insufficient illumination of the chicken houses. The author made a number of experiments in the construction of nests and roosts so that these structures could be readily cleaned and illuminated. In combating the chicken mite with direct remedies the author tested the value of a method which consisted in cleaning the houses once every 2 weeks and dusting them with a mixture containing 3 parts of air-slaked lime and 1 part sulphur. This method was quite effective, but the author believes that the insecticide should be applied at least once per week. Good results were obtained from the use of crude petroleum and kerosene. These insecticides were sprayed or rubbed upon the walls of the nests and other structures in the chicken houses. Kerosene was found to be as effective as crude petroleum, but its effects did not persist so long, since it evaporated more rapidly. During the season of the year when dust is not accessible to the hens the author recommends that boxes containing road dust should be provided for them. Badly infested old chicken houses of slight value may be burned and new ones constructed, or they may be disinfected by the remedies already mentioned and the use of boiling water. Poultry houses should not be in connection with barns or stables, and sitting hens should be isolated from the rest of the hens, so as to prevent their infestation by mites.

The incineration in the open field of carcasses affected with anthrax, VOLMER (*Berlin. Thierärztl. Wchnschr., 1902, No. 41, pp. 617, 618*).—Various material has been used in producing heat for the incineration of anthrax carcasses in the open field, and notes are given on the comparative cost of the process according to these different methods. The author recommends that the incineration be conducted under the direction of officials, so that complete destruction of the carcasses may be secured.

Innocuous disposal of animal carcasses by means of burning, LOTHES and PROFÉ (*Berlin. Thierärztl. Wchnschr., 1902, No. 37, pp. 557–560*).—A detailed report is given of a number of experiments which were conducted for the purpose of determining the relative effectiveness and cost of various incineration methods for destroying animal carcasses. It is recommended that unusual care be exercised to secure the complete destruction of all carcasses in cases of serious infectious diseases.

American meat inspection, A. ZSCHOCKE (*Deut. Thierärztl. Wchnschr., 10 (1902), Nos. 31, pp. 301–304; 32, pp. 309–312*).—Attention is called briefly to meat inspection in this country as conducted under the auspices of city, State, and national authority. Detailed notes are given on the method of inspecting meat under the orders of the Bureau of Animal Industry, and on veterinary police work, transportation of animals, and other functions of this Bureau.

TECHNOLOGY.

A study of cider making in France, Germany, and England, with comments and comparisons on American work, W. B. ALWOOD (*U. S. Dept. Agr., Bureau of Chemistry Bul. 71, pp. 114, pls. 7, figs. 26*).—The author visited some of the more important cider-making districts in France, Germany, and England, and describes the methods observed in those countries in the manufacture of cider. Factories are described in some instances as well as the machinery used, and the methods of harvesting the fruit, handling the must, fermenting, clarifying, etc.

Analyses are given of a large number of European and American ciders and a short bibliography of French, German and English works on cider making is appended.

The effects of fermentation upon the composition of cider and vinegar, C. A. Browne, jr. (*Jour. Amer. Chem. Soc., 25 (1903), No. 1, pp. 16-33, fig. 1, dgms. 2*).—A 25-gal. cask was filled with the fresh cider of an unknown variety of apples. The cask was stored in a dry, cool cellar from November 15, 1898, to October 13, 1902, and analyzed from time to time to determine the chemical changes which took place. Fermentation was the greatest from the fourth to the seventh week after storing. During fermentation the sucrose and dextrose were completely removed, but a small percentage of levulose remained unaffected owing to the development of acetic acid, which arrests alcoholic fermentation. In the experiment 100 parts of sugar gave an actual yield of 45.4 parts of alcohol, or about 88.8 per cent of the theoretical yield. The loss in weight of the cider during the 169 days of the alcoholic fermentation was about 2.4 per cent. It is pointed out that in cider making a very serious loss in alcohol may result from the development of acetic acid. In the experiment recorded there was a loss of about 0.7 per cent of alcohol formed from sugar by the development of 0.23 per cent of acetic acid. The loss in cider making from this source, it is stated, can be prevented largely by racking off the cider after the main fermentation into other casks and bunging tightly. Since the presence of acetic acid is detrimental to the development of alcohol, the failures reported by farmers in getting the vinegar to "make" when they add fresh cider to old vinegar is accounted for.

In the acetic fermentation 100 parts of alcohol gave an actual yield of 116.3 parts of acetic acid, or 89.2 per cent of the theoretical yield.

The bung of the vinegar cask was left open for 18 months from July, 1900. During this period the weight of the vinegar in the cask decreased 30 per cent. The acetic acid content decreased over 2.5 per cent, due mostly to destructive fermentation caused by *Bacterium xylinum*, or an allied form which had the property of forming cellulose. During the deterioration of the vinegar there occurred a relatively high increase in the percentage of reducing sugar. Upon examination this was found to be caused by the presence of 2 well-defined osazones, one of which after recrystallization melted at 142 to 143°, and therefore corresponded to the phenolformosazone of Fischer.

"As a remedy against deterioration, vinegars intended for storage should be racked off into clean casks, the latter filled full and tightly bunged. Since none of the acetic organisms can thrive without air, their further development is thus prevented, and the loss from destructive fermentation reduced to a minimum."

Analysis of the dried settlings in the vinegar cask gave the following results: Moisture, 4.91 per cent; fat, 1.69 per cent; protein, 20.13 per cent; ash, 2.65 per cent; crude fiber, 5.69 per cent; nitrogen-free extract, 64.93 per cent. Analyses were also made of the ash of apples, cider, and vinegar settlings. These are shown in the following table:

Ash analyses of apples, cider, and vinegar settlings.

	Ash of apples.	Ash of cider.	Ash of settlings.
	Per cent.	*Per cent.*	*Per cent.*
Potassium oxid	58.31	60.60	19.94
Ferric oxid and aluminum oxid	12.26	6.00	19.97
Calcium oxid	Undetermined.	1.15	4.17
Magnesium oxid	Undetermined.	Undetermined.	2.22
Phosphoric acid	12.51	7.12	29.64
Sulphuric acid	6.87	4.15	.14
Silicic acid	1.65	1.90	24.23
Undetermined carbonic acid, etc	8.40	19.08	....

Notes on vinegar making, E. F. Pernot (*Oregon Sta. Bul. 73, pp. 8*).—Vinegar was made at the station from undersized and otherwise unsalable prunes. After running the washed and weighed prunes through a homemade machine with spiked rollers which lacerated and tore them, the mass was inoculated with a pure culture of yeast (*Saccharomyces cerevisia*). This caused a strong and rapid fermentation, which broke down the cell walls of the prunes, thus liberating the clear juice, which flowed into a receptacle below the vat. This method of securing the clear liquid was inexpensive and very satisfactory. In all 10,482 lbs. of Italian prunes were used, from which 630 gal. of juice was obtained, or a yield of a little more than 3 gal. of juice per bushel of fruit. The juice was fermented in open barrels. Fermentation was completed in 10 days, when the juice was found to contain 10 per cent alcohol. It was then inoculated with a pure culture of vinegar ferment (*Bacilli pasteuranum*) by floating it on the surface of the liquid by means of pieces of cork weighted so as to bring the culture in contact with the liquid.

The vinegar thus produced was of excellent quality, with a fruity flavor and good body, analyzing 6.89 per cent total solids. The only objection to it was its color, which was that of very dark wine. It was, however, but little darker than imported malt vinegars, which find ready sale in Oregon markets. Experiments are now in progress to see if some method of clarification can be found which will improve the color. The machine used for lacerating the prunes and the vat for fermenting and collecting the juice are described in detail, and a brief discussion given of the principles of vinegar making and of the best ways of making vinegar for the home.

The small vinegar fly (*Drosophila ampelophila*) was allowed to walk over sterile cultural media under control conditions. Wherever its feet touched the media colonies of acetic-acid germs developed. The digestive tract of this fly was also found to contain large numbers of acetic-acid germs which were capable of growth in sterilized cider. It is therefore believed that this fly is of service in inoculating fruit juices with the necessary germs for producing vinegar. They will also, however, carry spores of molds and other organisms which give a bad flavor to vinegar. Therefore, the use of pure cultures of vinegar ferments is advised. The author states that the station can furnish these, upon application, to residents of the State.

Pear vinegar containing 8.89 per cent acetic acid has been made at the station, and apple vinegar which analyzed 6 per cent acetic acid within 4 months from the time the apples were pressed.

The essentials in making good vinegar are thus stated: "The barrels must be free from must and mold, the depth of the liquid should not exceed the surface measure, free air must be continually admitted, an even, warm temperature should be maintained, and, last but not least, the fruit that is used should be free from decay and mold."

Experiments in wine making, H. Schellenberg (*Jahresber. Vers. Stat. u. Schule, Wädensweil, 1899-1902, pp. 44-46*).—Sal ammoniac added to a cask of pear cider at the rate of 20 gm. per hectoliter conduced to a more rapid and complete fermentation of the must than when it was omitted. Pears just beginning to ripen were used. No influence of the sal ammoniac on the taste of the wine could be detected. Apple and pear wines filtered through a cellulose filter kept fresher during storage and were more highly prized than wine clarified by the addition of 60 gm. of gelatin per hectoliter. A variety of sweet apple was gathered for cider when just beginning to ripen. The flesh was still firm and somewhat acid. A given quantity of these apples yielded more juice and produced a better quality of cider than apples of the same kind gathered 3 weeks later when they had become more mellow. Wine that had become flat in drawing off and clarifying was again made drinkable by the addition of carbonic acid.

Composition and determination of differently prepared wines, W. Kelhofer (*Jahresber. Vers. Stat. u. Schule, Wädensweil, 1899-1902, pp. 99-103*).—Analyses are given of wines in which juice only was fermented, pulp and juice fermented together, and juice to which sugar and water had been added.

American wines at the Paris Exposition of 1900, their composition and character, H. W. Wiley; **with a monograph on the manufacture of wines in California,** H. Lachman (*U. S. Dept. Agr., Bureau of Chemistry Bul. 72, p. 40, pls. 2*).—An account is given of the judging of American wines at the Paris Exposition, including analyses of those which received awards. The wines examined included 9 samples of sparkling wines, 2 of brandies, 15 of dry white wines, 22 of dry red wines, 9 of sweet white wines, and 9 of sweet red wines. The analyses are much more complete than those recorded of American wines in the earlier bulletin from the Bureau (E. S. R., 12, p. 994), including data on the glycerol content, specific gravity, polarization, content of alcohol, tartaric acid, sulphurous acid, phosphoric acid, potassium sulphate, extract, ash, reducing sugars, total and volatile acids, and nitrogen. The analytical data obtained are compared with the analyses of standard European wines.

In the second part of the bulletin a discussion is given of the methods observed in California in the production of different California wines. A list is given of the varieties of wine grapes grown and the kinds of wine made from each. In addition, such other matters are discussed as harvesting, fermentation, clarification, tasting, bottling, marketing, and type of wines.

Agricultural fermentation industries, E. Boullanger (*Industries agricoles de fermentation. Paris: J. B. Baillière & Son, 1903, pp. XII + 306, figs. 66*).—This is a volume of the agricultural encyclopedia published under the direction of G. Wery. It treats of cider making; brewing; preparation of hydromel, brandies, and rum; and distilling.

Musts and wines in distilling, L. Lévy (*Les mouts et les vins en distillerie. Paris: C. Naud, 1903, pp. IV + 651, figs. 160*).—This book deals with the history of distilling, statistics of the industry, theoretical considerations, the chemistry of the compounds involved in the process, a study of the natural products from which alcohol is prepared, and the technology of the preparation of wines and musts.

The preparation of cherry wine with and without the addition of currants, W. Kelhofer (*Jahresber. Vers. Stat. u. Schule, Wädensweil, 1899–1902, pp. 95–99*).—An account of the making of wine from cherries alone, cherries to which citric acid and sugar had been added, and from cherries and currants to which water and sugar had been added. In some cases the juice was fermented alone and in others with the flesh, skins, etc., of the fruit. In order to prevent the development of acetic acid in the cherry-currant wine it is advised that fermentation take place in a cool dark cellar at a low temperature.

Annual report on investigations and progress in the manufacture of sugar, J. Bock (*Jahresber. Zuckerfab., 41 (1901), pp. XII + 374, figs. 48*).—A review for the year 1901 of investigations on the culture and handling of sugar beets and the manufacture of beet sugar.

Cassava as a competitor of maize in the production of starch and allied products, G. Archbold (*Jour. Soc. Chem. Ind., 28 (1903), No. 2, pp. 63–66, figs. 3*).—A discussion of the yield and characteristics of starch from cassava based mainly upon the work of the Bureau of Chemistry of this Department and an account of the method of manufacture followed in Florida. Cassava yields about 25 per cent of starch which "would easily take the place of corn starch or starch made from other cereals." The general conclusion reached is "that in cassava, when properly cultivated, we have a formidable competitor of maize, owing to its higher yield of starch and glucose per acre, and as not only is its starch and sugar, but also a considerable portion of the fiber, obtained as glucose, thereby producing a much sweeter and finer-flavored product, and better adapted for confectionery, etc., fully 30 per cent of the fresh root being obtained as glucose."

A new method of extracting olive oil, A. FUNARO (*Staz. Sper. Agr. Ital., 35 (1902), No. 11–12, pp. 916–921*).—A description is given of a method of oil extraction that is said to yield several per cent more oil than that secured by the ordinary process.

Modern American tanning (*Chicago: Jacobsen Pub. Co., 1902, pp. 292, pls. 14, figs. 2*).—This is a compilation of articles on the manufacture of leather which appeared originally in *Hide and Leather.*

AGRICULTURAL ENGINEERING.

Report of irrigation investigations, Humboldt River Valley, Nevada, J. D. STANNARD (*Nevada Sta. Bul. 54, pp. 91, pls. 34*).—A report is given of observations on the extent and character of irrigation practiced in the valley, irrigation works, crops grown, claims to water and their adjudication, the unit of measurement, and the distribution and more economical use of water are discussed, with suggestions as to the improvement of the system and methods now in vogue.

Eleventh Biennial Report of the State Engineer of Colorado, 1901–2, A. J. McCUNE (*Denver, 1902, pp. 334, ills.*).—This volume is devoted largely to reports from various superintendents of irrigation and water commissioners, crop statistics, and other routine matters, but contains special reports on Drainage and Seepage Measurements, by C. G. Elliott; and The Measurement of Water, by A. L. Fellows (E. S. R., 13, p. 1103).

Irrigation works of India, R. F. PATTERSON (*U. S. Consular Rpts., 71 (1903), No. 270, pp. 356–359*).—A brief account of these works, including statistics of capital invested, revenues, and area irrigated. The capital outlay to the end of 1900–1901 is given as $128,181,526, the net revenues $8,740,016, the area irrigated 13,547,986 acres.

Irrigation in Spain and North Africa, J. BRUNHES (*Thesis, Univ. Paris, 1902, pp. XVII + 518, figs. 63, maps 7*).—This treatise deals with geographical conditions, methods, and organization and is styled a study in human geography. The regions chosen for study are the Spanish Peninsula, Algiers and Tunis, and Egypt. There is added a bibliography of a large number of publications on irrigation used or cited in the preparation of this treatise.

The Nile dams and reservoir, SIR B. BAKER (*Pop. Sci. Mo., 62 (1903), No. 6, pp. 550–561, figs. 6*).—This is an address given before the Royal Institution of Great Britain.

A self-adjusting weir (*Irrig. Age, 18 (1903), No. 5, pp. 138, 139, figs. 3*).—A brief statement of the claims made for such a device, invented by C. C. Carlisle, assistant State engineer of Wyoming. The principal feature of this weir is a short movable conduit, connected with floats, which moves up and down over the end of a fixed conduit (which is a little smaller in diameter) as the level of the water in the canal rises and falls. The joint between the movable and fixed conduits is sealed with mercury.

On the conversion of a tidal marsh into a meadow, G. BECKER (*Deut. Landw. Presse, 30 (1903), No. 15, pp. 118, 119*).

Recent progress in the field of agricultural machinery (*Fühling's Landw. Ztg., 51 (1902), Nos. 11, pp. 410, 411; 12, pp. 450, 451; 13, pp. 488–492; 14, pp. 521–524, figs. 2; 15, pp. 556–559, figs. 2; 16, pp. 601–603, figs. 2; 17, pp. 638–641, figs. 3; 18, pp. 681–683, fig. 1; 19, pp. 725–727, fig. 1; 20, pp. 765–767, figs. 2; 21, pp. 797, 798, fig. 1; 22, pp. 832–835; 23, pp. 871–874, figs. 2; 24, pp. 910–914, figs. 6*).—This is a series of articles on this subject by different authors, including H. Puchner, A. Nachtweh, and W. Heerberger. The subjects discussed in these articles include root and straw cutters, harrows and soil levelers, hay-tedder and press, plows, scythe-sharpening machine, hitching device for horse powers, root digger, mowers and reapers, stationary and portable steam engines.

Methods and machines for cultivating the soil, M. Ringelmann (*Travaux et machines pour la mise en culture des terres. Paris, 1902, pp. 188, figs. 267*).

Test of binders, 1902, A. Nachtweh (*Arb. Deut. Landw. Gesell., 1903, No. 79, pp. 68, figs. 64*).—Six grain binders of American make are described and tests of the amount and character of work performed by them and of the draft are reported.

Practicability and adaptability of gasoline engines for agricultural conditions, G. Timberg (*K. Landt. Akad. Handl. och Tidskr., 43 (1903), No. 1, pp. 26–35, figs. 3, dgm. 1*).

Note on simple machines for extracting plantain fiber, R. L. Proudlock (*Dept. Land Records and Agr., Madras, Vol. II, Bul. 47, pp. 261–268, figs. 2*).—Attention is called to the possibilities of the common plantain as a fiber plant, and descriptions of 2 types of primitive machines used in the Philippine Islands for extracting the fiber are given.

Measures for the prevention of accidents with agricultural machinery, W. Hoffstedt (*K. Landt. Akad. Handl. och Tidskr., 43 (1903), No. 1, pp. 14–25, figs. 9*).

Proceedings of the Jefferson Memorial and Interstate Good Roads Convention, held at Charlottesville, Va., April 2, 3, and 4, 1902 (*U. S. Dept. Agr., Office of Public Road Inquiries Bul. 25, pp. 60, pls. 5, figs. 3*).

Road construction, L. H. Adams (*Wisconsin Sta. Rpt. 1902, pp. 280, 281, pl. 1*).—A brief account is given of the construction of a macadam road on the University of Wisconsin farm.

Silos and silage, C. S. Plumb (*U. S. Dept. Agr., Farmers' Bul. 32, rev. ed., pp. 30, figs. 6*).—A thorough revision of this bulletin, which has been in large part rewritten.

MISCELLANEOUS.

Fourteenth Annual Report of Connecticut Storrs Station, 1901 (*Connecticut Storrs Sta. Rpt. 1901, pp. 253*).—This includes the organization list of the station, a financial statement for the fiscal year ended June 30, 1901, a report of the director presenting a general review of station work during the year, and miscellaneous articles noted elsewhere.

Fifteenth Annual Report of Georgia Station, 1902 (*Georgia Sta. Rpt. 1902, pp. 251–260*).—This includes the organization list of the station, reports of the commissioner of agriculture and the director on the work of the station during the year, and a financial statement for the fiscal year ended June 30, 1902.

Twentieth Annual Report of New York State Station, 1901 (*New York State Sta. Rpt. 1901, pp. 434*).—This includes the organization list of the station; a financial statement for the year ended September 30, 1901; a list of periodicals received by the station; a meteorological record noted elsewhere; and reprints of circulars of the station on ginseng culture and "red albumen" and of Bulletins 197–211 of the station on the following subjects: The food source of milk fat, with studies on the nutrition of milch cows (E. S. R., 13, p. 781); inspection of feeding stuffs (E. S. R., 13, p. 774); an epidemic of currant anthracnose (E. S. R., 13, p. 758); notes from the botanical department (E. S. R., 13, p. 759); report of analyses of commercial fertilizers for the spring and fall of 1901 (E. S. R., 13, p. 935); San José scale investigations, III (E. S. R., 13, p. 968); a study of enzyms in cheese (E. S. R., 13, p. 1087); report of analyses of Paris green and other insecticides in 1901 (E. S. R., 13, p. 1068); influence of manure upon sugar beets (E. S. R., 13, p. 1042); commercial fertilizers for onions (E. S. R., 13, p. 1047); conditions affecting weight lost by cheese in curing (E. S. R., 13, p. 1088); stable manure and nitrogenous chemical fertilizers for forcing lettuce (E. S. R., 13, p. 1046); treatment for San José scale in orchards—I, orchard fumigation (E. S. R., 13, p. 1064); the immediate effect on milk production of changes in the ration (E. S. R., 14, p. 77); and director's report for 1901 (E. S. R., 14, p. 95).

Twenty-fourth Annual Report of North Carolina Station, 1901 (*North Carolina Sta. Rpt. 1901, pp. XX+128*).—This includes the organization list of the station, general reports on the different lines of station work, a financial statement for the fiscal year ended June 30, 1901, and reprints of Bulletins 175–180 of the station, on the following subjects: Some new species of the genus Cratægus and notes on some dichotomous Panicums (E. S. R., 12, p. 827), the relative values of some nitrogenous fertilizers (E. S. R., 13, p. 122), edible mushrooms of North Carolina (E. S. R., 13, p. 225), the nature of pentosoids and their determination (E. S. R., 13, p. 321), the composition of cotton-seed meal (E. S. R., 13, p. 479), and the sugar beet in North Carolina (E. S. R., 13, p. 446).

Fifteenth Annual Report of Tennessee Station, 1902 (*Tennessee Sta. Rpt. 1902, pp. 16, figs 2*).—This includes the organization list of the station, departmental reports upon the work of the station during the year, a list of available station publications, and a financial statement for the fiscal year ended June 30, 1902.

Nineteenth Annual Report of Wisconsin Station, 1902 (*Wisconsin Sta. Rpt. 1902, pp. 302*).—This includes the organization list of the station; a report of the director containing a brief description of the new agricultural building, notes on changes in the station staff, brief statements concerning the control of fertilizers and feeding stuffs and other lines of station work, and a list of available station publications; a brief biographical sketch of the late Prof. E. S. Goff; numerous articles abstracted elsewhere; lists of exchanges and acknowledgments; and a financial statement for the fiscal year ended June 30, 1902.

Proceedings of the sixteenth annual convention of the Association of American Agricultural Colleges and Experiment Stations, held at Atlanta, Ga., October 7-9, 1902, edited by A. C. TRUE, W. H. BEAL, and H. C. WHITE (*U. S. Dept. Agr., Office of Experiment Stations Bul. 123, pp. 144, pls. 2*).—For a summary of the proceedings see E. S. R., 14, p. 313.

On the establishment of agricultural experiment stations in Mexico, S. BONANSEA (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 17 (1902), No. 6, pp. 235–249*).—An argument in favor of the establishment of such stations and a statement of lines of work they might usefully undertake.

The promotion of agricultural science, W. H. JORDAN (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 22–33*).—This is the presidential address delivered at the twenty-third annual meeting of the Society for the Promotion of Agricultural Science, held at Pittsburg, 1902.

General agriculture, P. DIFFLOTH (*Agriculture générale. Paris: J. B. Baillière & Son, 1903, pp. XII+416, figs. 102*).—This is one volume of the agricultural encyclopedia published under the direction of G. Wery. The subjects discussed are agrology, including study and analysis of the soil and the relation of the soil to plants; cultivation of the soil, including reclamation, preparation, improvement, distribution of fertilizers and soil amendments, seeding, maintenance, destruction of weeds, harvesting, and preservation of crops; and rotation.

Practical farming and gardening (*Chicago and New York: Rand, McNally & Co., 1902, pp. 500, figs. 223, chart 1*).—This book consists of a series of chapters by different authors, to which are appended extensive lists of publications bearing on the special subjects discussed. In the several articles an attempt has been made to present "a brief but sufficiently comprehensive introduction to modern agricultural practice . . . to give so clear an insight into the essentials of farming under modern conditions as will simplify and illuminate all future reading . . . and to tell the man who wants to read on any given farm topic where he may find the book he wants." The articles included are: Modern Ideas in Soil Treatment and Tillage, by J. J. Edgerton; Field Crops—Their Adaptations and Economic Relations, with Specific Cultural Directions, by J. J. Edgerton; Vegetable Garden and Trucking Crops, by A. T. Erwin; Fruit Culture and Forestry, by L. R. Taft; Important Injurious Insects and Diseases Affecting Field and Garden Crops, Fruits, and Shade Trees, by E. S. G. Titus; Selecting and Feeding Farm Animals for Profit, by H. W. Mumford; Beef Making, by L. H. Kerrick; Feeding Native Cattle for Beef, by J. P. Stevenson; Feeding Range Cattle for Beef, by D. Rankin; Diseases of Farm Animals, by R. A. Craig; The Silo in Modern Agriculture, by F. W. Woll; Making Poultry Pay, by P. H. Jacobs; Handy Rules and Useful Information; and Wholesome Cooking Without Waste.

The book of the farmer, A. Bruttini (*Il libro dell'agricoltore. Milan: Ulrico Hoepli, 1902, pp. XIX+446, figs. 303*).—A popular treatise discussing the soil and plant life; giving directions for the culture of the vine, and all important field, orchard, and garden crops, and describing the raising and feeding of live stock.

The Lupitz estate and its production, C. Vibrans (*Die Wirtschaft Lupitz und ihre Erträge. Berlin: Deut. Landw. Gesell., 1902, pp. 33*).—The history of the estate is given, together with annual financial statements showing the profits due to the Lupitz system of improving sandy soils.

Recent foreign explorations as bearing on the agricultural development of the Southern States, S. A. Knapp (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 35, pp. 44, pls. 6, figs. 2*).—This bulletin deals with the method and cost of rice production and the culture of certain other crops in Japan, Ceylon, India, China, and the Philippine Islands. The agricultural conditions and practices in each of the different countries are discussed.

Cooperations among farmers for certain economic ends, M. Hansson, E. Insulander, and G. Leufven (*Meddel. K. Jordbruksdept. [Sweden], 1902, No. 6, pp. 158, maps 3*).—The report contains an historical description and discussions of cooperative enterprises among farmers in the line of creameries, dairy control associations, bull associations, purchasing associations, and egg-shipping associations. Samples of articles of agreement are given in the case of each kind of association.—F. W. WOLL.

Report of the Bureau of Farmers' Institutes, 1900 (*Rpt. New York State Dept. Agr., 8 (1900), IV, pp. 489*).—This contains a list of the farmers' institutes held in 1900, numerous questions asked and answered, and 22 papers presented at the meetings. Among the subjects considered were the following: The Composition and Use of Fertilizers, by L. L. Van Slyke; Butter Making, by G. A. Smith; Barn Construction and Sanitation, by H. E. Cook; Alfalfa in New York, by F. E. Dawley; Temperature and Moisture in Relation to Cheese Ripening, by L. L. Van Slyke; The Evolution of Dairying, by J. Van Wagenen, jr.; The Next Step in the Education of the Farmer, by W. H. Jordan; The Silo and the Material to Fill It, by I. P. Roberts; and The Progress of Dairy Farming in Canada, by J. Robertson.

The officials and laborers of Upper Egypt, H. C. Hanson (*Deut. Landw. Presse, 30 (1903), Nos. 13, pp. 97–100, fig. 6; 15, pp. 117–119, figs. 3*).

Commercial relations of the United States with foreign countries during the year 1902 (*Washington: Department of State, Bureau of Foreign Commerce, 1903, vols. 1, pp. 1225; 2, pp. 989*).

Agricultural and commercial statistics for 1901, B. E. McLin (*Rpt. Comr. Agr. Florida, 1901 and 1902, pp. 133–217*).—Statistics on the production of field crops, vegetables, fruits, live stock, dairy products, and miscellaneous products for each county in the State and on the imports and exports of Florida.

Agricultural returns for Great Britain, 1902 (*London: Bd. Agr., 1903, pp. VII+33*).—Tables are given showing the total produce and yield per acre of the principal crops in each county of Great Britain with summaries for the United Kingdom.

General index to the reports and bulletins of the experimental farms of the Dominion of Canada, 1887–1901 (*Ottawa, 1902, pp. 194*).

NOTES.

Connecticut Storrs Station.—At a recent meeting of the board of control L. A. Clinton, who for the past year has been serving as acting director of the station, was made director.

Florida University.—The State legislature has changed the name of the Florida Agricultural College to University of Florida.

Hawaii Station.—The station has begun an extensive series of experiments with tomatoes to try to overcome some of the very serious difficulties of growing this vegetable in the Tropics. The experiments include methods of culture, tests of varieties, protection from insects, etc.

Illinois University and Station.—The Illinois general assembly has made an appropriation of $135,000 per annum for two years for the support of the college of agriculture and experiment station. The appropriation is more than double that for the two preceding years and is distributed as follows: For instruction, equipment, and buildings, $50,000; live-stock investigations, $25,000; soil investigations, $25,000; dairy investigations, $15,000; horticultural investigations, $10,000, and corn investigations, $10,000.

Kansas Station.—O. H. Elling, a graduate of the college, has been appointed foreman at the Fort Hays Branch Experiment Station.

Maine Station.—Horace W. Britcher, assistant zoologist of the station, died April 30, after a lingering illness. He had just returned from Arizona, where he had gone in the hope that the climate might prove beneficial.

Missouri University and Station.—Howard S. Reed, B. A., of the University of Michigan, has been appointed instructor in botany in the university and assistant botanist to the station, and G. S. Reeves, B. S., laboratory assistant in entomology, University of Illinois, has been appointed instructor in entomology in the university and assistant entomologist to the station.

Montana Station.—At a recent meeting of the executive board S. Fortier, the director of the station, was granted one year's leave of absence for the purpose of studying the irrigation conditions in California in connection with the irrigation investigations of this Department.

New Hampshire College and Station.—H. M. Tucker has resigned his position as superintendent of the farm.

New Mexico College and Station.—R. F. Hare, assistant chemist, has been placed in charge of the chemical work of the college and station until July 1. The legislature has made an appropriation of $25,000 for buildings and has increased the tax levy for the support of the college from one-fifth to two-fifths of a mill. Farmers' institute work has recently been organized and institutes held in three localities, with very gratifying results. Experiments at the station in pumping water from a 6-inch well for irrigation and other purposes have been very successful. A 12-inch well is now being sunk for further experiments in pumping, and measuring weirs and a water register for the study of the duty of water have been installed.

Cornell University.—T. F. Hunt, dean of the college of agriculture of the Ohio State University, has been elected professor of agronomy.

Ohio Station.—The station has been provided with a complete outfit for electrotyping and printing, and is now printing its own publications.

Rhode Island College and Station.—An appropriation of $3,000 for one year has been made for student labor and for agricultural demonstrations. A laboratory for the study of animal diseases, particularly poultry diseases, is being fitted up by the station, and additions are being made to the poultry plant for the purpose of facilitating studies of the blackhead disease of turkeys.

South Carolina College and Station.—Committees have been appointed by the board of trustees for the purpose of securing plans for an agricultural building, including a pathological laboratory for the division of botany and bacteriology, and an insectary for the division of entomology, an iron-frame greenhouse, a building for the Young Men's Christian Association, and a gymnasium.

South Dakota Station.—The work of testing cereals in cooperation with this Department which has been conducted at Mellette for the past two years has been transferred to the substation at Highmore on account of advantages of the latter as regards location and climate. The highest market price ($7.25 per hundred live weight, shorn) was recently received at Chicago for lambs fed at the station.

Wisconsin University.—Charles R. Van Hise, professor of geology, has been elected president of the university. His new duties will begin with the next academic year.

U. S. Department of Agriculture.—C. B. Simpson, investigator, Division of Entomology, has been appointed entomologist in the Transvaal department of agriculture. The appointment is for three years beginning July 1. E. S. G. Titus has been appointed to fill the vacancy in the Division.

Carnegie Institution.—The first Yearbook of the Carnegie Institution of Washington has recently been issued. It constitutes a volume of over 300 pages and contains an account of the work of the institution for the year 1902. The first part of the volume is devoted to a reproduction of the articles of incorporation and by-laws of the institution, together with the trust deed of Mr. Carnegie, the minutes of the meetings of the incorporators of the institution and of the board of trustees, and the proceedings of the executive committee. The greater part of the volume is occupied with reports of advisory committees who were consulted with regard to problems in various lines of research which might well be encouraged and supported by the Carnegie Institution. The volume contains reports from advisory committees on the following subjects: Economics, botany, physics, geology, geophysics, geography, meteorology, chemistry, astronomy, paleontology, zoology, physiology, anthropology, bibliography, engineering, psychology, history, and mathematics. The lines of work which are recommended by the various advisory committees are much diversified and cover very wide fields of research. In a summary of the plans and methods thus far agreed upon it is stated that it is within the purpose of the Carnegie Institution to encourage any branch of science, but that efforts will be made to secure cooperation with other institutions and to direct the energies of the Carnegie Institution in such manner as not to interfere or compete with the work of other agencies or institutions. It is stated that specific grants will be made for different purposes to individual investigators, and these grants may be used for any purpose necessary for the prosecution of the work undertaken by the different investigators. In the appendix to the volume detailed accounts are presented of a number of proposed biological explorations and investigations on a large scale. These include a biological survey of the Palearctic region, South and Central America, the establishment of biological experiment stations for studying evolution and other problems, an antarctic expedition, and an investigation of subterranean temperatures. The funds required for all these proposed lines of research would be far in excess of those at the disposal of the institution, and attention will therefore be concentrated upon the selection of certain problems which appear to require immediate assistance.

NATIONAL FARM SCHOOL AT DOYLESTOWN.—The bill relating to this school as finally passed by the Pennsylvania legislature and signed by the governor carried an appropriation of $10,000 for the biennial period instead of $15,000 as previously announced. The post-office address of this school is Farm School, Bucks County, Pa.

AMERICAN CHEMICAL SOCIETY.—The Society will hold its twenty-eighth general meeting at Cleveland, Ohio, June 29 and 30, 1903. In the announcement of the meeting the attention of those who will present papers is called to the desirability in most cases of a brief, clear presentation of results rather than technical details which, though very suitable in published papers, are generally out of place in meetings of this kind in which the time available for the presentation of papers is usually limited.

MISCELLANEOUS.—The legislature of Hawaii at its recent regular session provided for a reorganization of the office of the commissioner of agriculture by placing the duties of that office under the control of a nonsalaried board of five commissioners. The new law defines the duties of the board and provides for the enforcement of its regulations. Under the new arrangement particular attention of the board is given to forestry, entomology, and inspection of plants, fruits, etc., to prevent the admission of injurious fungi and insects. For this work paid superintendents and assistants are provided. For the development of general agriculture, cooperation with the experiment station established by this Department is to be sought, and such an arrangement can hardly fail to be of benefit to the station as well as to the islands.

The Connecticut Agricultural College announces a summer school for teachers and others in nature and country life, to be held at Storrs, Conn., from July 6 to 28. The work will consist of lectures and field and laboratory studies. The subjects offered for instruction include birds, insects, geology, botany, landscape gardening, forestry, flower growing, soils, farm crops, fruits, vegetable growing, farm animals, stock feeding, milk production, poultry, natural science, and the pedagogy of nature study.

The first edition of *El Cafetal*, a monthly review devoted exclusively to the coffee industry in all its branches, appeared April 1. It is a journal of about 20 pages and is published in Spanish at the Produce Exchange Building, New York, in the interests of coffee producers of the Latin-American countries.

The first number of a new veterinary periodical entitled *Fortschritte der Veterinär-Hygiene* was issued in April of the present year. The ground which will be covered by this periodical includes the whole field of veterinary hygiene, and the periodical will include original articles and abstracts.

Dr. Michael Woronin, the well-known Russian botanist, died in St. Petersburg March 5, 1903, in his sixty-fifth year.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, PH. D., *Assistant Director.*

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Entomology and Veterinary Science—E. V. WILCOX, Ph. D.
Horticulture—C. B. SMITH.
With the cooperation of the scientific divisions of the Department.

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NOTE.—The publications of the United States Department of Agriculture, except those of the Weather Bureau, may be purchased from the Superintendent of Documents, Washington, D. C. For the publications of the Weather Bureau, requests and remittances should be directed to the Chief of the Bureau. The price of the Record is $1 per volume, or 10 cents per number. The prices of other technical publications are given in the list above. The publications of the State experiment stations are distributed from the stations and not from the Department.

EXPERIMENT STATION RECORD.

VOL. XIV. JULY, 1903. No. 11.

The plans for the exhibit of the colleges of agriculture and mechanic arts and the experiment stations at St. Louis next year are now taking sufficiently definite form so that an outline of the proposed exhibit can be given. The general committee has held two meetings, one on the grounds at St. Louis, and the subcommittees have been industriously working out the details of their respective parts. At a meeting of the full committee at Columbus June 20 the general plan and many of the details were formally adopted.

The exhibit will aim to show in a quite comprehensive way the methods and results of work of the colleges and stations, with a view to bringing out the characteristic features which distinguish them from other educational and research institutions, and the extent and scope of their fields. To this end the exhibit will be a collective one, in the sense that the work of the various institutions will be shown collectively rather than in the form of individual exhibits by the different colleges. It will thus be essentially a cooperative enterprise between the various institutions, acting through the committee appointed to prepare the exhibit, and will be made up quite largely of materials furnished by the different colleges and stations, classified and arranged so as to form a well-rounded whole. This will prevent duplication, but will in no way detract from the credit given individual institutions.

Strictly speaking, the appropriation of $100,000 made by Congress can not be used for the purchase of exhibits as such, but is intended to pay the expense of assembling, installation, and care. A liberal construction of the act, however, will allow the purchase of certain materials and objects used in the preparation of an exhibit to supplement the assistance given by the institutions themselves, but the amount which it has been possible to set aside for this purpose is relatively small. The committee has already found from its estimates of the necessary expenses for cases, fitting up of laboratories and other features upon the space, the installation and maintenance of the exhibit, the packing and transportation of the materials to and from St. Louis, and other necessary items, that it will be necessary to practice economy in order to accomplish what is desired.

The location decided upon is in the Palace of Education, where a very desirable space, comprising about 11,500 square feet, has been assigned to the committee by the exposition authorities. This space occupies a conspicuous position in the building, is well lighted, and is adjacent to the educational exhibits of several foreign countries. The division of space as agreed upon gives about 4,000 square feet to mechanic arts, 6,000 square feet to agriculture, and 450 square feet each to the Bureau of Education and the Office of Experiment Stations.

The plans for mechanic arts have not yet been worked out in detail by the subcommittees in charge. In general, the main divisions of this portion will be civil, mechanical, electrical, mining and chemical engineering; architecture, drawing and shop practice; and industrial and domestic arts, the latter to include domestic science. A canvass has been made of the colleges, which has indicated a large amount of material to be available in most of these lines.

The general divisions of the agricultural portion of the exhibit will be plant production, including horticulture and forestry; zootechny, including animal husbandry and veterinary science; agrotechny, including dairying and other lines of agricultural manufactures, such as sugar making, wine making, canning, meat products, tobacco, etc.; rural engineering; and rural economics. There will be no separation of the instruction work from the experiment station work, as was done at Chicago, but the different lines will be united so as to show their interrelations, and this will frequently avoid duplication. In plant production, for instance, the exhibit will show the materials used for instruction as well as the methods and results of investigation, including the study of plant diseases and injurious insects, the inspection work, the results of plant breeding, etc. There will be a working laboratory for soil physics, showing equipment for both instruction and investigation, with exhibitions of typical soils, standard fertilizing materials, methods of studying the fertilizer needs of soils and plants by means of pot culture, etc.

As illustrating the means of instruction in animal husbandry it is proposed to show a model class room, equipped with the special provisions in the way of models, charts, illustrative material, etc., which experience has suggested as advantageous to this line of instruction. This, it is thought, can be made a novel and attractive feature, and serve to show the progress which has been made in adapting and providing facilities for class-room work. Another section of this exhibit will show the investigation work in the breeding, feeding, and management of animals. This is expected to include a model of the Armsby respiration calorimeter, equipment for digestion work, examples of important lines of feeding work with various kinds of live stock, and methods of breeding, together with some of the results, notably with poultry. The veterinary science laboratory will likewise include both methods of instruction and of research, and will contain illustrations of typical results of the stations' work in study of animal diseases and their control.

Dairying will constitute a prominent feature in point of space and in variety and character of methods and results presented. There will be a working dairy laboratory, together with a model creamery for purposes of instruction. The results of the stations' work in showing the relation of food to quality of dairy products, the effect of microorganisms, the curing of cheese, and other work relating to the progress of dairying, will be illustrated by specimens, models, and charts. The important work which has been done in sugar production, both from sugar cane and from the sugar beet, as well as the studies on maple sugar, will be shown in a sugar laboratory, adjacent to which other lines of agricultural manufactures will be illustrated.

The exhibit in rural engineering will include the layout of farms, farm buildings and machinery, irrigation, drainage, and road construction. In connection with the irrigation and drainage exhibits experimental and model systems will be shown, with fields arranged to illustrate different methods of irrigation, drains for removing excess of water, and provided with a pumping plant. This should prove one of the most attractive and instructive features of the whole exhibit, but from its character need not be very expensive.

One controlling idea which has been borne in mind in planning the exhibit has been to provide as many features as possible which would in a measure be self-explanatory and would attract the attention of the passer-by. The experience of the past has shown that objects, models, and exhibits containing some feature in operation are a more successful means of illustration than charts and diagrams, although it is difficult to fully illustrate some lines of station work without the latter. Frequently some feature can be used to attract the attention, which can then be led to a more detailed presentation. Several attendants to act as demonstrators are planned for.

In addition to the exhibit in the Palace of Education, the exposition authorities have agreed to provide a building where the work in animal husbandry, especially in stock judging, can be shown. This will consist of a stock-judging room where the work can actually be carried on with provision for block tests, the cutting up of beef, cooking tests, etc. A considerable sum of money has been set apart by the committee for the purposes of this exhibit outside the education building.

The plans for the preparation of the exhibit include the collaboration of the Office with the central office of the committee. In the case of certain laboratories and parts of the exhibit the assembling of the materials, and in general the method of presentation, will be assigned to experts, who will act in collaboration with the committee. Definite requests will be made of individual institutions for contributions in their respective specialties.

The exhibit at St. Louis will differ in some respects from any previous exhibit which our colleges and stations have made. The first undertaking of the kind was at Chicago ten years ago on a considerably smaller space. At that time the whole exhibit was placed in the agricultural building. The much smaller exhibits which have been since made at Buffalo, Paris, and Charleston have related very largely to the experiment station work, and have likewise been classed with the agricultural exhibits. The change of location to the education building therefore makes a new departure, the reasons for which may not at once be patent.

There can be little question regarding the desirability of classifying that portion of the exhibit relating to the land-grant colleges in the education building. The stations are legally, and actually for the most part, departments of these colleges; and, furthermore, the experiment station exhibits of the foreign countries will be made in the education building in connection with their educational exhibits.

But there is still another reason. While the work of the experiment station touches agricultural practice on the one hand, and this relationship has been most often emphasized, it also touches agricultural education on the other. It has been referred to as constituting the capstone of agricultural education, and it quite as truly furnishes the foundation for it. Indeed it is on its educational side that the experiment station movement is destined to exert its most profound and permanent influence; for the investigations and experiments of the stations not only provide much material for effective courses of instruction in the theory and art of agriculture, but they also furnish to the farmer the hitherto lacking motive for definite technical education along the lines of his art. This is changing the intellectual attitude of the farmer from conservatism to progressiveness.

The experiment station work in its practical application has already won its way with the farmers of the country, and its utility needs no further demonstration or advertising. But there has been a desire on the part of many to bring out its broader relations and its position in the whole system of agricultural education, which is not so generally realized and appreciated. The St. Louis Exposition has been thought to furnish a good opportunity for enforcing this conception of the stations. The leading purpose of the whole exhibit is to show the strong place which the land-grant colleges and the experiment stations have taken in our educational system. If it can once be made clear and apparent that agriculture has a pedagogic form, then educators can be looked to to take it up and provide a place for it in the general scheme, from the common school to the higher institutions of learning, and the interest and support of teachers can be invoked.

This result is a most desirable one from the experiment station standpoint. A better educated rural population will be better able to make use of the experiment station work. The highest use of the experiment station must depend upon an educated constituency.

This issue concludes the regular abstract numbers of volume fourteen. Number twelve will, as usual, be devoted to the subject and name index to the current volume. This is now well under way and will be issued as speedily as possible.

The revision of the manuscript of the general index to the first twelve volumes of the record has proved a more formidable and time-consuming task than was anticipated. The work has not been allowed to lag, however, but has been pushed forward unremittingly during the past winter and spring. It is a pleasure to state that this index is now approaching completion and will soon be ready for the printer.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Improved method for separation and determination of total alkalis in soils, J. H. Petit (*Jour. Amer. Chem. Soc., 25 (1903), No. 5, pp. 496–498*).—To avoid error due to presence of barium carbonate the official method is modified as follows: "Just previous to evaporating the solution of the chlorids in platinum dishes a few cubic centimeters of an ammonium sulphate solution—75 gm. to the liter—are added. The precipitate is filtered and the filtrate evaporated, as usual, in platinum dishes and ignited. In this way the barium is completely removed at one operation and the alkalis are changed into sulphates, which can be ignited over the full heat of the Bunsen burner without danger of loss through volatilization. . . . After igniting to a red heat about 1 gm. of dry, powdered ammonium carbonate is added to the dish and volatilized, thus breaking up any acid sulphates which may have formed."

The solubility of barium sulphate in ferric chlorid, aluminum chlorid, and magnesium chlorid, G. S. Fraps (*North Carolina Sta. Rpt. 1902, pp. 50–52*).—The results of tests made by the author at room temperature and compared with results obtained by Fresenius show that barium sulphate is much less soluble in a 10 per cent solution of ferric chlorid or aluminum chlorid than in 10 per cent nitric or hydrochloric acid, but more readily soluble in a 10 per cent solution of ammonium chlorid than in a 10 per cent solution of ferric chlorid or aluminum chlorid. In the presence of barium chlorid barium sulphate was found to be less soluble in ferric chlorid or aluminum chlorid than in 10 or 2.5 per cent solutions of ammonium chlorid, a 2.5 per cent solution of sodium chlorid, nitric acid, or hydrochloric acid.

Methods for the determination of total phosphoric acid and potash in soils, C. B. Williams (*Jour. Amer. Chem. Soc., 25 (1903), No. 5, pp. 491–496*).—See E. S. R., 14, p. 630.

The determination of citric-acid-soluble phosphoric acid, R. Woy (*Chem. Ztg., 27 (1903), No. 24, pp. 279, 280*).—The author briefly reviews recent literature on this subject, especially that tending to show the superiority of his method (E. S. R., 9, p. 321) over that of Böttcher as regards accuracy. Some modifications of the method are described.

The determination of citric-acid-soluble phosphoric acid in Thomas slag, O. Böttcher (*Chem. Ztg., 27 (1903), No. 22, pp. 247, 248*).—Further studies of the applicability and advantages of the author's preliminary test for silica in slags (E. S. R., 14, p. 834) are reported.

A quick practical method for determining the amount of acid required in the preparation of superphosphates, W. Strzoda (*Chem. Ztg., 27 (1903), No. 26, p. 299*).—To 20 gm. of the phosphate or fertilizer mixture 30 cc. of crude sulphuric acid about 53° B. is added, the mixture shaken, and allowed to stand ½ hour in a warm place (50 to 80° C.). The volume is made to 1 liter and free acid determined by titration. Knowing the exact strength of the original acid, the results thus obtained furnish data for calculating the acid required for reducing the phosphate.

The determination of nitrogen in nitrates and nitric-acid esters, A. WOHL and O. POPPENBERG (*Ber. Deut. Chem. Gesell., 36 (1903), pp. 676–685; abs. in Chem. Centbl., 1903, I, No. 15, p. 893; Jour. Chem. Soc. London, 84 (1903), No. 486, II, p. 328*).—Nitrogen is determined by decomposing the substance with sulphuric acid and mercury in an exhausted flask, which is thoroughly shaken until the substance is completely dissolved, the pressure in the flask, then being determined by means of a manometer. The most serious source of error, the possible formation of oximes, is overcome by adding chromic acid to the sulphuric acid. Various corrections which should be applied are given.

On the determination of organic nitrogen in the presence of nitric nitrogen, A. QUARTAROLI (*Staz. Sper. Agr. Ital., 36 (1903), No. 1, pp. 17–21*). In the method proposed 1 gm. of substance is treated with 10 cc. of formic acid in a flask and 5 cc. of concentrated sulphuric acid is slowly added in the cold with constant stirring, the operation being continued in a Schultze-Tiemann apparatus in the usual way.

A burette and standard solutions convenient for the determination of nitrogen by the Kjeldahl method, A. W. BOSWORTH (*Jour. Amer. Chem. Soc., 25 (1903), No. 5, pp. 535–537*).—Using 1 gm. of substance for the determination, the distillate is collected in 8 cc. of ½-normal sulphuric or hydrochloric acid. This is titrated with 14.04-normal alkali, which is run in from a burette graduated in reverse order; that is, the zero point is the lowest mark. This burette is filled at the beginning to the 56.16 cc. mark, and the readings give percentages of nitrogen multiplied by 10.

The estimation of small amounts of carbon monoxid in the air, SPITTA (*Arch. Hyg., 46 (1903), No. 3, pp. 284–310, fig. 1*).—The method proposed depends upon the oxidation of the carbon monoxid to dioxid in the presence of added hydrogen, by means of palladium heated by an electric current.

The distribution of arsenic in nature, F. GARRIGOU (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 24, pp. 1113–1115*).

The determination of sulphur in plants, G. S. FRAPS (*North Carolina Sta. Rpt. 1902, pp. 42, 43*).—Since this article was originally published (E. S. R., 13, p. 916) it has been found more satisfactory, as stated in a note, to substitute calcium acetate for potassium nitrate in the preparation of the ash.

The determination of sulphur and chlorin in plants, G. S. FRAPS (*North Carolina Sta. Rpt. 1902, pp. 44–49*).—This is a less detailed account of the work presented before the Association of Official Agricultural Chemists in 1902 (E. S. R., 14, p. 114), the results of which were in favor of the nitric acid method, modified by the substitution of calcium acetate for potassium nitrate for the determination of total sulphur, and the method of ignition with sodium carbonate for the determination of chlorin, as compared with several other methods.

The sulphur content of some vegetable materials, W. A. WITHERS and G. S. FRAPS (*North Carolina Sta. Rpt. 1902, pp. 53–58*).—Determinations of the sulphur content of a number of vegetable materials are reported. The authors found that the ash of plants contains only a portion of the total sulphur. The ash of cotton-seed meal was found to contain 1/6, cotton-seed hulls 1/5, oats 1/10, cowpeas 1/6, corn 1/50, peanuts 1/3, and tobacco 4/5 of the total sulphur. The sulphur content was found to be greater than has usually been considered. The sulphur content of an ash is considered no indication of the amount of sulphur in the plant, and conclusions reached by ash analyses as regards the sulphur content of the plant are therefore considered entirely valueless.

The determination of pentosan-free crude fiber, G. S. FRAPS (*North Carolina Sta. Rpt. 1902, pp. 59–62*).—This paper was presented before the Association of Official Agricultural Chemists in 1901 (E. S. R., 13, p. 410). The results of tests show that the König method yields a fiber practically free from pentosans and requires fewer manipulations and less time than the usual method.

Russian export butter and methods of its examination, I. Shirokikh (*Selsk. Khoz. i Lyesor., 208* (*1903*), *Mar., pp. 691–700*).—It is stated that Russian butter is considered very unsatisfactory in England. The author believes that this opinion is due to a lack of acquaintance with the composition of the butter and to the preponderating importance attached to the content of volatile fatty acids to the neglect of the content of nonvolatile fatty acids.

The method of determining nonvolatile acids, as elaborated by the author, is described. The fat is saponified in the usual manner and the soap is digested on a water bath with a 10 per cent solution of tartaric acid until the nonvolatile acids rise to the surface as a transparent layer. The water is practically all expelled by heating over a free flame, constant shaking being required to prevent violent bumping. There remains in the flask a crystalline precipitate of potassium acid tartrate, a layer of fatty acids, free tartaric acid, and traces of water. The water is entirely removed by placing the flask for half an hour in the steam drying oven. The flask is cooled in a desiccator and ether is added. The extract, which should be transparent and without flakes, is filtered through a dry filter into a weighed flask, and the ether is driven off on a water bath. Drying to a constant weight is easily accomplished. The weight represents the percentage of nonvolatile acids in the fat.

Analyses of 5 samples of typical export butter are reported. These show a range in the water content of from 10.2 to 10.9 per cent; salt content, 0.8 to 3.0 per cent; nonvolatile acids, 88.2 to 88.9 per cent; insoluble acids, 85.3 to 87.6 per cent; Reichert-Meissl number, 21 to 27.4; saponification equivalent of fat, 216.5 to 229.8; milligrams of potassium hydrate required to saturate 1 gm. of the nonvolatile acids obtained by the author's method, 214 to 220, and 1 gm. of the insoluble acids, 206 to 216; iodin number of fat, 26.5 to 38.6; iodin number of nonvolatile acids, 26.6 to 38.5; iodin number of insoluble acids, 25.5 to 38.9, and the specific gravity of fat, 0.8632 to 0.8662. The low content of volatile acids is attributed to the method of feeding.—P. FIREMAN.

Studies of methods of estimating fat in animal substances, W. Glikin (*Arch. Physiol.* [*Pflüger*], *95* (*1903*), *No. 3–4, pp. 107–145*).—A comparison of the principal methods of estimating fat in animal materials led to the conclusion that it may be most satisfactorily determined by extraction with low-boiling petroleum ether (50 to 60° C.). The lecithin in the extracted fat may be separated by taking advantage of the fact that it is insoluble in aceton.

The estimation of the salicylic acid content of berries and stone fruits, Süss (*Oesterr. Chem. Ztg., 5* (*1902*), *No. 21, p. 488*).—The data noted in a paper presented before a meeting of the German Naturalists and Physicians led the author to conclude that salicylic acid was not found unless it had been added.

Some of the constituents of cacao and their determination, J. Dekker (*Inaug. Diss., Univ. Bern, 1902, pp. 83*).—An investigation of the various chemical methods of determining different constituents of cacao.

Investigations on Chinese rhubarb, K. Heuberger (*Inaug. Diss., Univ. Bern, 1902, pp. 62*).—A chemical investigation of the various constituents of rhubarb.

The hydrolysis of crystallized oxyhemoglobin of horses' blood, E. Abderhalden (*Ztschr. Physiol. Chem., 37* (*1903*), *No. 5–6, pp. 484–494*).—Experiments were undertaken to determine the cleavage products of oxyhemoglobin.

The hydrolysis of crystallized serum albumin of horses' blood, E. Abderhalden (*Ztschr. Physiol. Chem., 37* (*1903*), *No. 5–6, pp. 495–498*).—A study of the cleavage products of crystallized serum albumin.

The hydrolysis of edestin, E. Abderhalden (*Ztschr. Physiol. Chem., 37* (*1903*), *No. 5–6, pp. 499–505*).—Experimental data are reported.

The hydrolysis of zein by hydrochloric acid, L. Langstein (*Ztschr. Physiol.*

Chem., *37* (*1903*), *No. 5–6*, *pp. 508–512*).—A study of the cleavage products obtained when zein is hydrolized with hydrochloric acid.

Tests and reagents, chemical and microscopical, known by their authors' names, together with an index of subjects, A. I. COHN (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd., 1903, pp. III+383*).

Report of the chemists, C. H. JONES and B. O. WHITE (*Vermont Sta. Rpt. 1902, pp. 268–271*).—Analyses of 34 miscellaneous samples, including fertilizing materials, wood ashes, muck, and feeding stuffs are reported.

Report on the progress of physical chemistry and physics during the year 1902, M. RUDOLPHI (*Chem. Ztg.*, *27* (*1903*), *No. 28*, *pp. 319–323*).—A review with numerous references to literature.

Proceedings of the nineteenth annual convention of the Association of Official Agricultural Chemists (*U. S. Dept. Agr., Division of Chemistry Bul. 73, pp. 187, pl. 1, figs. 5*).—This account of the proceedings of the meeting held in Washington October 2–4, 1902, is edited by the secretary of the association, H. W. Wiley. For a summary of the proceedings see E. S. R., 14, pp. 107–116. A memoir of the late Robert C. Kedzie, by L. S. Munson, and an article on the determination of glucose by E. Gudeman (E. S. R., 14, p. 224) have been included.

BOTANY.

The variation of reserve carbohydrates in the stem and roots of ligneous plants, LECLERC DU SABLON (*Compt. Rend. Acad. Sci. Paris*, *135* (*1902*), *No. 20*, *pp. 866–868*).—The author has made a study of the sugar and starch which are found in the interior of ligneous plants throughout the course of the year. In order that his results might be comparable, plants of the same age and as nearly as possible the same condition were grown under identical conditions. At intervals of about 40 days specimens were removed, thoroughly washed, and the stems and roots examined for their reserve carbohydrates. The variation observed in the stems and roots of chestnut seedlings is shown in the following table:

Variation in the carbohydrates in the stems and roots of chestnut trees.

Date.	Sugar.		Other carbohydrates.		Total carbohydrates.	
	Stems.	Roots.	Stems.	Roots.	Stems.	Roots.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
January 11	4.0	1.9	20.7	25.3	24.7	27.2
February 26	4.3	4.7	20.4	21.0	24.7	25.9
March 28	2.7	3.3	18.8	21.4	21.5	24.7
May 20	2.3	3.1	17.6	16.7	19.9	19.8
June 22	2.1	3.6	18.3	18.2	20.4	21.8
July 27	2.6	3.6	18.5	20.7	21.1	24.3
September 12	2.2	1.8	23.7	28.5	25.9	30.3
October 19	2.2	1.6	24.2	27.5	26.4	29.1
November 22	3.2	1.1	21.5	27.8	24.7	28.9
December 26	3.7	1.9	19.3	25.4	23.0	27.3

From this table it is shown that during the winter, when growth is apparently suspended, the total reserves diminish gradually, and in general the root contains more reserve material than the stem. This difference, however, is more apparent in autumn and winter than in the summer. The roots contained more sugar during the period of active growth, and the stems contained their highest proportion during the resting period of the plant. Pear, peach, quince, and alder trees were examined in a similar way, and the results obtained are comparable with those given above.

A study of the reserve carbohydrates of some palms, E. LIÉNARD (*Compt. Rend. Acad. Sci. Paris*, *135* (*1902*), *No. 15*, *pp. 593–595*).—A study is reported on certain reserve carbohydrates found in the endosperm of a number of palms. The author finds that of the species studied the reserve material consists of small quantities of reducing sugars, saccharose, mannan, and galactan.

Formation of albumen by the higher plants in the dark, I. Shulov (*Izv. Moscow Selsk. Khoz. Inst. [Ann. Inst. Agron. Moscou], 8 (1902), pt. 4, pp. 410–412*).—The experiments of the author were made with beets in glass vessels. In each vessel, provided with sand fertilized with a mixture of nutritive salts (without nitrogen), was planted 1 beet root. After 14 days 4 roots were taken out, 4 more after 24 days, 2 after 34 days, and 1 after 44 days, and the total nitrogen determined by the Kjeldahl method and the albuminoid nitrogen after Stutzer. The results were as follows:

Relation of albuminoid to total nitrogen in plants grown in the dark.

	Roots not sprouted.	Sprouted roots, after—			
		14 days.	24 days.	34 days.	44 days.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Total nitrogen	1.255	1.700	1.620	1.495	1.820
Albuminoid nitrogen	.560	.805	.820	.880	.945
Proportion of albuminoid to total nitrogen	44.620	47.350	50.620	58.860	51.920

These results seem, in the opinion of the author, to show beyond a doubt the possibility of the formation of albumen by the green plants when growing in the dark.—P. FIREMAN.

The influence of organic materials on the development and structure of certain plants, J. Laurent (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 20, pp. 870–872*).—A report is given of studies with peas, lentils, maize, and rye in which glucose and glycerin were added to the culture solution in which the plants were grown. It was found that if the solutions of glucose and glycerin were isotonic they gave comparable results so far as the development and external characteristics of the plants were concerned. The osmotic pressure not only produced modifications, but each species exercised a specific influence. The diameter of the cells increased with the osmotic pressure of the culture medium, the phenomena being most apparent in the solutions of glycerin where the cells of the corticle parenchyma increased much more rapidly and assumed a nearly spherical form. Solutions of glucose and saccharose in general produced a thickening and lignification of the cells. The glucose was not only used for the growth of the membranes, but also the reserve starch which had accumulated in different parts of the tissues. The reserve materials were found most abundant in those plants grown in cultures containing the glycerin; on the contrary, the lignification was less noticeable and the differentiation of tissues occurred much later. This is particularly true of the ligneous plants by which a great part of the glycerin was absorbed and utilized. In the case of maize, starch was not accumulated either in the roots or the stems and the glycerin was used immediately. In this case the glycerin favored the thickening of the cell membranes and lignification of the tissues.

The germination of pollen in the presence of stigmas, P. P. Richer (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 16, pp. 634–636*).—On account of its possible bearing on the limits of the production of plant hybrids the author made a study of the germination of pollen grains when in the presence of stigmas. A large number of species were examined and it was found that many kinds of pollen which could not be made to germinate either in water or sugar solutions readily sent out their pollen tubes if fragments of stigmas of the same or nearly related species were added to the cultures. While a few exceptions were noted it was only when the stigmas of the same or nearly related species were added that germination took place. From this fact the author concludes that the stigmas of plants secrete substances which favor the germination of the pollen of related species and prevent that of very dissimilar ones.

Canadian experiments with Nitragin for promoting the growth of legumes, F. T. Shutt and A. T. Charron (*Proc. and Trans. Roy. Soc. Canada, 2. ser., 6 (1900), Sec. III, pp. 55–70, pls. 2*).—A brief review is given of the subject of nitrogen assimilation by leguminous plants, and the efforts that have been made in the preparation of pure cultures of the nitrogen-assimilating organisms are described. The authors conducted a series of experiments at the experimental farm, Ottawa, with Nitragin, using a preparation for clover, horse beans, alfalfa, vetches, and peas. The results with clover, peas, and horse beans are described at considerable length. The experiments, with the exception of the horse beans, were on the whole satisfactory and furnished evidence as to the value of this inoculating material. The experiments with clover and peas invariably gave higher yields for treated plats when compared with those grown in similar soils and under like conditions except as to inoculation. The vitality of the bacteria in the culture medium is the most serious detriment to its use. These organisms are particularly susceptible to temperatures above 100° F. as well as to strong light, and their vitality can not be guaranteed for more than about 6 weeks from the time of preparation. For this reason it is considered doubtful whether the use of Nitragin will ever come into general practice by farmers.

Photosynthesis without living plants, L. Macchiati (*Rev. Gén. Bot., 15 (1903), No. 169, pp. 20–25, figs. 2*).—The author briefly reviews the published results of a number of investigators on the possibility of enzyms being concerned in photosynthesis, after which he describes experiments which seem to indicate that these ferments have an important bearing upon the subject of photosynthesis. After carefully washing leaves in distilled water, a glycerin extract was made which when shaken with benzin gave an amorphous, flocculent precipitate, recognized as the enzym present in the leaves. At the same time the leaves were washed, and after drying for 3 hours at a temperature of 100° C. were finely powdered, and part of the powder was again extracted with glycerin. This yielded an enzym similar to that taken from the living leaves. Both the enzyms and the dried, powdered leaves were subjected to experiments to demonstrate their ability to carry on photosynthesis. As a result of numerous experiments the author found that the glycerin extract alone was unable to accomplish any photosynthesis, but the powdered leaves containing the enzym, either alone or when the glycerin extract was added to them, were able to liberate oxygen forming formaldehyde. These experiments, the author believes, indicate that photosynthesis is due to the presence of a soluble ferment and the chlorophyll acts simply as a chemical screen or a sensibilizer.

A preliminary account of this investigation is given in *Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 24, pp. 1128, 1129.*

Methods in plant physiology, H. S. Reed (*Jour. Appl. Micros. and Lab. Methods, 5 (1902), Nos. 10, pp. 2004–2006; 11, pp. 2045–2048; 12, pp. 2084, 2085; 6 (1903), Nos. 1, pp. 2127–2129; 2, pp. 2174–2176; 3, pp. 2231–2234, figs. 10*).—The author gives directions for a number of experiments in laboratory investigations on plant nutrition, osmosis, transpiration, photosynthesis, enzyms, etc.

Phyllobiology, A. Hansgirg (*Phyllobiologie. Leipzig: Borntraeger Bros., 1903, pp. XIV+486, figs. 40*).—In this volume the author gives the results of many years' observations on the biological phenomena which are associated with leaves of deciduous plants. The special modifications and adaptations of the leaves of 61 families of plants are described, and their grouping according to ecological types is discussed. The various protective adaptations of young leaves, leaves of seedlings, etc., are treated in a separate chapter.

Reports of Danish experiment stations for plant culture during 1900 and 1901 (*Tidsskr. Landbr. Planteavl, 8 (1902), pp. 194–222; 9 (1902), pp. 141–164*).—

Reports of investigations conducted at the State experiment stations at Vester Hassing, Askov, Tystofte, and Lyngby.

FERMENTATION—BACTERIOLOGY.

Further studies on nitrogen-assimilating bacteria, GERLACH and VOGEL (*Centbl. Bakt. u. Par., 2. Abt., 9* (*1902*), *Nos. 22–23, pp. 817–821; 24, pp. 881–892*).—Experiments are described with *Azotobacter chroococcum* in cultures containing varying amounts of grape sugar. The authors and others had previously shown the possibility of nitrogen assimilation by this and other organisms when grown in nutrient media containing the proper carbohydrates. In the experiments here reported from 1 to 15 gm. of grape sugar were added to each liter of culture medium and after 5 weeks' growth of the organism the nitrogen content was determined by the Kjeldahl method. Uniformly increasing gains are reported for each culture up to the one receiving 12 gm. of grape sugar. Beyond this amount there was a decided falling off in the nitrogen increase. The amount of nitrogen taken from the air by these cultures varied from 7.4 mg. to 127.9 mg. per liter of media. When cultures were used to inoculate soils in which oats, mustard, and carrots were grown there was no gain in the total nitrogen even when cultures were employed that had shown active nitrogen assimilation in the laboratory. In no case was the condition of the plants improved by the inoculation, but in a number of instances decided losses were observed. These experiments were repeated several times in all, 60 pots and 3 different soils being employed.

Some recent investigations in nitrogen assimilation by bacteria without symbiosis, J. VOGEL (*Fühling's Landw. Ztg., 52* (*1903*), *Nos. 5, pp. 178–180; 6, pp. 213–220*).—The results of pot and field tests of the so-called nitrogen assimilating bacteria which do not live symbiotically, particularly of *Azotobacter chroococcum*, are reported. Comparisons are made of the yield, dry matter, and nitrogen content of oats, mustard, and carrots grown in pots and in the field, the soil in each case having received the same kind of complete fertilizer. The effects of inoculating with pure cultures, adding grape sugar to the soils, and the presence of a comparatively large amount of nitrate of soda, were compared. In the pot experiments with oats and mustard increases were noted for the inoculated series, although those pots receiving nitrate of soda gave the largest yields. When subjected to field conditions all inoculated plats gave less yields of dry matter and nitrogen than the uninoculated. In this case the author states that inoculation seemed to have exerted an injurious influence upon the product.

Concerning the specific identity of the tubercle bacteria of the Leguminosæ and the agricultural importance of this subject, H. BUHLERT (*Habilschr. Friedrichs-Univ. Halle, 1902, pp. 55; also Centbl. Bakt. u. Par., 2. Abt., 9* (*1902*), *Nos. 5, pp. 148–153; 6–7, pp. 226–240; 8, pp. 273–285*).—A discussion is given of the relation of tubercle bacteria to leguminous plants and their function in the assimilation of free atmospheric nitrogen. The author reviews the publications of a number of investigators on this subject and gives the results of his studies in which he claims that the bacteria of the root tubercles which are found on many leguminous plants are all identical with *Bacillus radicicola* of Beijerinck. From the root tubercles of some leguminous plants there were found bacteria which seemed to be very much specialized, but this specialization does not extend to differences that may be regarded as specific. The usefulness of bacteria for inoculating purposes is demonstrated, but it is thought to be confined within rather narrow limits. There does not yet appear to be any pure culture preparation that is entirely trustworthy, and on this account the author recommends recourse to soil inoculations to supply the required organism.

A contribution to the Alinit question. S. SEVERIN (*Centbl. Bakt. u. Par., 2. Abt., 9 (1902), Nos. 19, pp. 712-720; 20, pp. 746-756*).—The results of cultures of various forms of Alinit bacteria, in which 2 well-marked varieties of *Bacillus ellenbachensis, B. megatherium,* and *B. subtilis* were grown in various media, are given. The author believes these organisms are specifically distinct, and points out some of their most marked differences. The results of culture experiments with commercial Alinit for oats are given in which negative results were obtained.

Bacteria in the soil, B. H. BUXTON (*Jour. Appl. Micros. and Lab. Methods, 5 (1902), No. 9, pp. 1975–1980, figs. 5*).—A description is given of methods for separating soil bacteria, their cultivation, and experiments with cultures of bacteria grown upon alfalfa. The article details methods for class demonstration, particularly of the nitrogen-assimilating bacteria.

Photobacteria in chlorophyll investigations, M. W. BEIJERINCK (*Proc. Sec. Sci. Koninkl. Akad. Wetensch. Amsterdam, 1902, IV, pp. 45–49*).—The value of photobacteria as indicators in investigations of chlorophyll functions is pointed out.

Pseudomonas fragariæ, a bacterium causing a strawberry-like odor, T. GRUBER (*Centbl. Bakt. u. Par., 2. Abt., 9 (1902), No. 19, pp. 705–712, pls. 2*).—A description is given of a species of bacteria which was isolated from fodder beets and cultivated upon various media. The organism produces a very pronounced strawberry-like odor, from which fact it derives its name.

The bacterial flora of the acid fermentation of some foods and condiments, R. WEISS (*Arb. Bakt. Inst. Hochschule, Karlsruhe, 2 (1902), p. 165; abs. in Centbl. Bakt. u. Par., 2. Abt., 9 (1902), No. 22–23, pp. 844, 845*).—The results of extensive studies of various plant and animal foods which have undergone fermentation are given. Particular attention is paid to the bacteria concerned in this fermentation, and 16 well known and 49 new species of bacteria were described. The new species, a list of which is given in the abstract, are fully described in the original publication.

Luminous bacteria, J. E. BARNARD and A. MACFADYEN (*Ann. Bot., 16 (1902), No. 64, pp. 587, 588*).—An abstract is given of a paper read before the British Association for the Advancement of Science at its meeting in 1902, in which an account is given of experiments conducted on luminous bacteria. The authors have found that the phosphorescence produced by various dead objects, such as fish, etc., is due to bacterial forms of life. The bacteria require rather particular and exact conditions in order to exhibit their luminous properties. They must have a suitable nutrient medium containing the proper proportions of various salts. Luminosity on the part of the bacteria appears to be a function of the living cell, and can be readily disturbed by any process which interferes with its vitality. Free oxygen is essential but in the absence of oxygen the organisms continue to live but are nonluminous. The process of lumination is evidently a vital one and is the result of active oxidation occurring within the cell.

The light produced by these organisms was examined with a spectrum and it was found that the spectrum of none of the luminous organisms extended to the red rays, and it may be assumed that there is no heat given off by them. An exposure to the temperature of liquid air did not destroy the luminosity of the organisms, and when triturated at the temperature of liquid air the luminous bacteria were broken up in such a manner as to cease to give off light.

Concerning the mechanism of agglutination, R. G. SMITH (*Proc. Linn. Soc. New South Wales, 27 (1902), pt. 1, pp. 66–72*).—A review is given of some recent investigations regarding the mechanism of agglutination in bacteria, and attention is called by the author to a previous publication in which it was shown that the function of salts in promoting agglutination is to attack the precipitate on the bacteria, causing it to become agglutinated or flocculated.

International catalogue of scientific literature. R—Bacteriology (*Internat. Cat. Sci. Lit., 8 (1902), pp. XIV+314*).—This is the first annual issue by the International Council of titles of articles and books relating to bacteriology. As mentioned elsewhere (E. S. R., 14, p. 637) it is an outgrowth of the Catalogue of Scientific Papers relating to scientific literature, published by the Royal Society of London. The plan of treatment is similar to that previously described for Botany, an author and subject catalogue being given for the different articles. In all, 2,206 titles are indexed, and for the subject index a decimal system of grouping has been adopted. The value of the catalogue is greatly depreciated by the very evident omission of works by American authors. Only 66 articles and 14 books of authors publishing in the United States during 1901 are listed, and these are distributed through 19 publications. No reference could be found to the work of this Department nor to that of any of the experiment stations, although many contributions were made to bacteriological literature during the year. A saving clause is inserted in the catalogue to the effect that "those portions of the literature of 1901 which are not dealt with in this volume will be included in the volume of Bacteriology which will form a part of the second annual issue of the catalogue." It is to be hoped that a more careful survey of the literature will be given in subsequent volumes.

The practice of industrial fermentation, E. Ozard (*La pratique des fermentations industrielles. Paris: Masson & Co., 1903, pp. 168, figs. 2*).—In this book the author describes the manufacture of alcohol and gives a general account of the various agents used in fermentation. These are considered under the separate headings of yeasts, molds, and diastases, and the advantage accruing from the use of pure cultures is shown. The methods of manufacturing pressed yeast and pure yeasts are described, after which the processes of the fermentation of beets, molasses, potatoes, artichokes, etc., in the preparation for distillation of alcohol, rum, or beer, are described. The subject of the manufacture and use of yeasts in baking is discussed, as well as the use of yeasts in wine making. In the concluding chapter the author describes the process of fermentation in the manufacture of citric acid, gallic acid, and indigo.

Technical mycology: The utilization of micro-organisms in the arts and manufactures, F. Lafar, trans. by C. T. C. Salter (*Philadelphia: J. B. Lippincott Co., 1903, Vol. II, pt. 1, pp. VIII+189, figs. 68*).—This is in continuation of Lafar's work on technical mycology, the first volume of which appeared in 1898 (E. S. R., 10, p. 520), and is the first part of the volume treating of Eumycetic fermentation. The general morphology and physiology of the Eumycetes are described, in which the chemical composition, action of mineral nutrients, stimulative influences, presence and action of enzyms in this group of ferments are discussed in detail. Fermentation by the Zygomycetes is discussed, the morphology, physiology, and fermentation by Mucor, Rhizopus and related organisms being treated. The use of some of these, such as the Chinese yeasts, *M. rouxii* and *Amylomyces* sp., in the fermentation of various kinds of spirits is described. The concluding portion of the book treats of the Saccharomyces, the morphology, life history, and anatomy of the yeast cell being fully discussed. With the concluding part of this volume, which is promised by the publishers as soon as the proofs are received from the author, this volume will supplement the first, which treats of the Schizomycetes and their use in the arts and manufactures. The recent advances in applied biology can hardly be appreciated until brought together in some such work as this, and Doctor Lafar has well performed his task.

The general theory of the action of diastases, V. Henri (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 21, pp. 916–919*).—The action of diastases is said in many respects to be similar to that produced by acids acting upon carbohydrates. The author has studied the action of invertin, emulsin, and amylase on various carbohydrates, from which he concludes that when the rapidity of inversion of saccharose is studied it is found that for a given amount of diastase the rate of inversion increases more rapidly than the strength of solution decreases below 0.1 normal, but if the strength of solution is increased beyond 0.1 normal the rate is independent of the concentration of solution. The result is the same for the action of emulsin on salicin and for amylase on starch or dextrin. The rapidity of inversion for invertin, emulsin, and amylase is proportional to the quantity of the ferment present. The addition of invert sugar to a mixture of saccharose and invertin checks the action of the diastase, and this is believed to be due to the levulose which is contained in the invert sugar. When a certain quantity of saligénin and glucose is added to salicin and emulsin the rapidity of inversion is checked in proportion as the amount of salicin is reduced. In a similar way a mixture of starch and amylase reduces the hydrolysis of starch. If the inversion of saccharose by invertin be carefully followed through, the reaction will be found to obey the same laws as those governing the inversion by acids. In the case of inversion of saccharose the action is more rapid than that by acids, and the hydrolysis of salicin by emulsion takes place more slowly. A theoretical discussion is given of the action of these different ferments.

Proteolytic enzyms in plants, S. H. Vines (*Ann. Bot., 17 (1903), No. 65, pp. 237–264*).—Since the publication of the author's paper on tryptophane (E. S. R., 14, p. 335) he has continued his observations on the distribution of proteolytic ferments in plants. There appear, from direct and indirect evidence, to be enzyms capable of digesting proteids in certain algæ, some fungi, and various flowering plants. In all cases the process involves the peptonization of the more complex proteids and the proteolysis of the simpler ones. The author's investigations were made with the proteids found normally in the tissues of the plant or upon the Witte-peptone, the object sought being a proteolytic enzym and not a hydrolyzing one. The color test for tryptophane was employed as in the previous investigations, and a large number of fungi, seeds, fruits, latex-bearing plants, stems, leaves, bulbs, tubers, and roots were examined. He found tryptophane present in the expressed juice or watery extracts of banana, melon, ripe cucumber (but not in the green one), vegetable marrow, tomato, onion bulb, and turnip root, but not in the juice of the orange, apple, or grape, nor in the extracts of tubers of potato and Jerusalem artichoke, or green peas, wheat seedlings, or any shoots or leaves examined. The substance has also been found in the milk of cocoanut, in extracts made from bean and pea seedlings, but not in seedlings of maize apart from the seed nor in asparagus, potato, or Jerusalem artichoke shoots, although it was found present in the potato shoots after they had turned green as the result of exposure to light. In the case of the fruits the author believes that tryptophane is certainly associated with the process of ripening and in the case of seedlings with the presence of a supply of reserve proteids.

In summarizing his results, it is claimed that the juices or tissues of various parts of plants act upon proteids so as to give rise to substances having a reaction similar to that of tryptophane. So far the author has been unable to isolate the substance, but he concludes that from the reaction shown by his experiments there is such a chemical substance as tryptophane. The experiments cited above are held to indicate that the vegetable substances showed the effect of proteolysis, which is to be ascribed to a proteolytic enzym contained in the juices or tissues themselves. The distribution of this substance in various orders of plants is briefly summarized, and the author emphasizes the fact that the results given in his paper must be taken as applied only to the particular season of the year during which the experiments were performed.

The growth and reproduction of Amylomyces rouxii, J. Turquet (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 21, pp. 912–915*).—The results of investigation on the growth and reproduction of the fungus commonly known as Chinese yeast is reported. The author reports that this fungus possesses not only an asexual method of reproduction, but forms spores in the myceliál filaments. These spores are carried at the ends of the filaments, the mode of production being similar to that in Mucor. So far as his cultures are concerned, the author did not observe the formation of any zygospores. From its mode of growth and asexual reproduction he believes that *Amylomyces rouxii* ought to be included in the genus Mucor and placed near *M. racemosus*.

ZOOLOGY.

A biological reconnoissance in the vicinity of Flathead Lake, M. J. ELROD (*Univ. Montana Bul. 10, pp. 89–182, pls. 30, figs. 3*).—This bulletin contains a description of the region about Flathead Lake, together with notes on the animals and plants which are to be found in that locality. Collections of mollusks, insects, and birds have been made and brief notes are given on the species collected. Among the miscellaneous material in the bulletin mention should be made of an account of the Flathead buffalo herd, which is maintained under the same conditions as range cattle and which numbers 220 pure-bred buffalo and 65 half breeds.

The thirty-first annual report of the board of directors of the Zoological Society of Philadelphia, A. E. BROWN (*Philadelphia: Allen, Lane & Scott, 1903, pp. 42*).—An account is given of the mammals, birds, reptiles, and batrachians in the gardens and menagerie, and of the species which were exhibited during the year for the first time. A list is also presented of animals born in the gardens during the period covered by the report, and notes are also given on the additions to the menagerie during the year. C. B. Penrose presents a list of animals which died during the season, together with notes on the causes of their death. A large percentage of these animals died of some form of tuberculosis.

The flame-breasted robin (Petrœca phænicea), C. FRENCH (*Jour. Dept. Agr. Victoria, 1 (1902), No. 9, pp. 906, 907, pl. 1*).—A brief discussion of the habits and food of this species of bird, which is considered as strictly insectivorous and recommended for protection.

The house sparrow, J. PERCIVAL (*Jour. Bd. Agr. [London], 9 (1902), No. 3, pp. 338–342*).—Notes are given on the destructive habits of the English sparrow, and this species is compared in its appearance and habits with other related species of sparrows. A scheme of rules is presented suitable for adoption by clubs and societies which may wish to form an organization for the destruction of this bird.

Contributions to the ornithology of São Paulo, H. VON IHERING (*Rev. Mus. Paulista, 5 (1902), pp. 261–330*).—Descriptive notes are given on the various families of birds with special mention of the feeding habits of some important species. A list of the birds which occur in the State of São Paulo is appended to the article.

Necessity of a federal game law and the protection of birds, H. VON IHERING (*Rev. Mus. Paulista, 5 (1902), pp. 238–260*).—Notes are given on the game birds which are at present protected by law at certain seasons of the year, and attention is called to the difficulties in the proper definition of the term "game" so as to exclude birds which should be protected during the whole season.

Destroying prairie dogs and pocket gophers, D. E. LANTZ (*Kansas Sta. Bul. 116, pp. 147–163, figs. 8*).—A copy is given of the State law of Kansas regarding the destruction of prairie dogs and pocket gophers. A circular letter of inquiry was sent out and the answers to this circular furnish the basis for an account of the distribution of these animals. At present it is estimated that the prairie dog villages in the State occupy an area of 2,000,000 acres. Experiments in destroying prairie dogs included the use of traps, fumigation with sulphur fumes and carbon bisulphid, and poisoning with arsenic, corrosive sublimate, barium carbonate, potassium cyanid, and strychnin. The best results were obtained from the use of carbon bisulphid and a proprietary poison formula which contained strychnin. In the destruction of the pocket gopher the author discusses briefly the value of bounties, poisonous gases, trapping, and the use of solid poisons.

Myriapods in the Museum of São Paulo, H. W. BRÖLEMANN (*Rev. Mus. Paulista, 5 (1902), pp. 35–237*).—A monographic account of this group of animals. The author presents an analytical key for the determination of genera and species and gives brief economic notes in connection with the numerous species described, a number of which are new.

METEOROLOGY—CLIMATOLOGY.

Report on international cloud observations. I, Historical, general circulation of the atmosphere. H. H. HILDEBRANDSSON (*Rapport sur les observations internationales des nuages. I, Historique, circulation générale de l'atmosphère. Upsala: Wretman, 1903, pp. 48, pls. 22*). This report contains a brief historical summary of the theories of Dove, Maury, Ferrel, and Thomson regarding the general circulation of the atmosphere and a review of the results of cloud observations at stations in different parts of the world in their bearing on these theories. The results are shown graphically in a series of charts for stations selected because of their position in certain critical latitudes, for example, San José de Costa Rica; "Square No. 3" (Lat. 0 to 10° N., Long. 20 to 30° W.); Manila; Mauritius; San Fernando and Lisbon; Habana; Lahore, Allahabad, and Calcutta; Kurrachee, Bombay, and Cuttack; Blue Hill; Paris; several in England, Germany, and Denmark; Upsala, and others in Sweden; and places in Norway, Siberia, China, Japan, and other regions.

The author's conclusions, as translated by Professor Ward,[a] are as follows: "(1) Above the heat equator and the equatorial calms there is, throughout the year, a current from the east which seems to have very high velocities at great altitudes. (2) Above the trades there is an anti-trade from SW. in the northern, and from NW. in the southern hemisphere. (3) This anti-trade does not extend beyond the polar limit of the trade; it is deflected more and more to the right in the northern, and more and more to the left in the southern hemisphere, and finally becomes a current from the west above the crest of the tropical high pressure belts, where it descends to supply the trades. (4) The districts at the equatorial margin of the trades are partly in the trades and partly in the equatorial calms, according to the season. Above them there is, therefore, an upper monsoon—the anti-trade in winter, and the equatorial current from the east in summer. (5) From the tropical high pressure belts the air pressure on the whole decreases continuously toward the poles, at least to beyond the polar circles. Further, the air of the temperate zone is drawn into a vast 'polar whirl' turning from west to east. This whirling movement seems to be of the same nature as that in an ordinary cyclone. The air of the lower strata approaches the center, while that of the higher strata tends out from the center, and this outward tendency increases with the altitude above sea level as far up as the greatest altitudes from which we have observations. (6) The upper currents of the atmosphere in the temperate zones extend over the tropical high pressure belts, and descend there. (7) The irregularities which are noted at the earth's surface, especially in the regions of the Asian monsoons, as a whole disappear at the lower or intermediate cloud levels. (8) We must entirely abandon the notion of a vertical circulation between tropics and poles which has up to this time been accepted in accordance with the theories of Ferrel and Thomson."

The climate of the Bermuda Islands. A. E. VERRILL (*The Bermuda Islands New Haven, Conn.: Author, 1903, pp. 82–91*).—This article is a part of a comprehensive treatise on the Bermuda Islands, published first in the Transactions of the Connecticut Academy of Arts and Sciences, volume 11. The principal factors determining the character of the climate of Bermuda are its insular position and proximity to the Gulf stream. These prevent extremes of temperature and sudden changes.

"The average temperature during the three winter months and March is from 63 to 66° F.; April, about 65.5°; May, 70.5°; June, 76°; July, 80°; August, 81.7°; September, 80°; October, 73.7°; November, 68°. The average for the year is about 70° F., but ranges from 69.5 to 70.5°. But temperatures as low as 50 to 53° are not uncommon in winter; 42° is rarely reached. It is rarely as high as 87° in summer, but the mean relative humidity, during the summer months, ranges from 80 to

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[a] Science, n. ser., 17 (1903), No. 436, pp. 752, 753.

91°. . . . The amount of rainfall is large, and it seems to be somewhat larger at Hamilton and Ireland Island than at St. George's. According to Lefroy's tables, covering 11 and 16 years, respectively, it was 54.66 in. at Ireland Island and 48.61 in. at St. George's. The amount near Hamilton in later years usually varied between 58 and 63 in., but in 1898 was only 48.19, and in 1900 it was 67.05 in. The rainfall is usually pretty well distributed throughout the year, but is generally greatest in October and November and least in the summer months, when droughts are not uncommon, but seldom very prolonged. Usually more or less rain falls on from 190 to 207 days; and on at least half of the days of all the months from November to April. But in many cases the rains are mere showers of very brief duration, . . . and in the summer time [the air] is often nearly saturated with moisture, so that it is very oppressive to many persons."

Fogs and hailstorms are rare. Thunderstorms are very common and sometimes violent. High winds are frequent, and destructive hurricanes sometimes occur. Frost, ice, and snow have been observed only a few times in the history of the islands, and no great damage has ever been done by them.

Meteorological observations for 1902 (*Colorado Sta. Rpt. 1902, pp. 153–199, 206–213*).—Tables prepared by R. E. Trimble give daily and monthly summaries of observations during 1902 on temperature, pressure, precipitation, dew point, relative humidity, terrestrial and solar radiation, direction and movement of wind, and occurrence of frost at Fort Collins, Colo.; monthly summaries of similar observations at Rockyford and Cheyenne Wells; and monthly summaries of observations on temperature and precipitation at Long's Peak House near Estes Park (elevation about 9,000 ft.), Gleneyre (elevation about 8,000 ft.), and Cowdrey (formerly Pinkhampton), North Park (elevation 8,400 ft.).

Tables are also given which summarize the monthly and annual precipitation at 7 different places in the State and show the monthly and annual rainfall at Fort Collins for the period from 1872 to 1902 with the normals for that period. The following is a summary of the principal meteorological data reported for Fort Collins: Mean temperature ($\frac{1}{2}$ maximum and $\frac{1}{2}$ minimum), 47.4° F.; maximum, 99.6°, August 1; minimum, −31.4°, January 6; precipitation, 18.43 in.; snowfall, 24.6 in.; mean relative humidity, 67 per cent. The normals for this place are, temperature, 46.6° F.; precipitation, 14.66 in.; mean relative humidity, 65.3 per cent.

The weather during the agricultural year 1901–2; rainfall, temperature, and bright sunshine during 1901 (*Jour. Roy. Agr. Soc. England, 63 (1902), pp. 457–469*).—Observations on temperature, rainfall, sunshine, etc., in Great Britain during 1901 and preceding years are reported and the general weather conditions of the different seasons of 1902 are discussed.

The cereal and other crops of Scotland for 1902, and meteorology of the year relative thereto, A. BUCHAN (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 15 (1903), pp. 319–350*).—A summary is given of observations on pressure, temperature, rainfall, cloudiness, direction of wind, etc., during the year, with notes on the general weather conditions during each month and crop and live stock reports from a number of different localities in Scotland.

Variations in rainfall at Hawkesbury Agricultural College, C. T. MUSSON (*Agr. Gaz. New South Wales, 14 (1903), No. 4, pp. 345–348, pls. 2*).—The results of observations with a series of 50 rain gages are reported, which show considerable variations in rainfall over a very small area. "Even in the case of heavy falls the two edges of an acre of ground, of a square form, might receive rain varying by 20 per cent or more. An accumulation of such variations would mean an important factor in the fortunes of the plant inhabitants, which would be emphasized in cases of where plant water requirements were low with heavy rain or high with least rain, or where soils varied much in texture and in relation to water-carrying capacity."

Analysis of red rain of February 22, R. A. EARP (*Nature [London], 67 (1903)*), *No. 1740, pp. 414, 415*).—Analysis of a red rain which fell on this date at Buckfastleigh, England, is reported, showing 37 gr. of suspended matter per gallon. This suspended matter dried at 100° C. contained 36.4 per cent of organic matter, 45.6 per per cent silica, 13.6 per cent alumina and iron oxid, 2.4 per cent magnesia, and 2 per cent of unclassified matter.

AIR—WATER—SOILS.

On the proportion of hydrogen in atmospheric air, A. Leduc (*Compt. Rend. Acad. Sci. Paris, 135* (*1902*), *No. 26, pp. 1332, 1333*).—A reply to Gautier, reiterating former conclusions.

A further examination of the objections of A. Leduc regarding the proportion of atmospheric hydrogen, A. Gautier (*Compt. Rend. Acad. Sci. Paris, 136* (*1903*), *No. 1, p. 21*).

Evaporation, R. E. Trimble (*Colorado Sta. Rpt. 1902, pp. 205–218*).—This is a monthly summary of observations during 16 years (1887–1902) on evaporation from a tank on the station grounds at Fort Collins, Colo.

Water supply and prevention of waste in leading European cities, C. O. Johnson (*New York: Merchants' Association of New York, 1903, pp. 289, figs. 2, dgms. 3*).—This contains reports on Glasgow, Liverpool, Manchester, Birmingham, London, Paris, Cologne, and Berlin.

New methods and apparatus for sterilizing water, Kausch (*Centbl. Bakt. u. Par., 1. Abt., 33* (*1903*), *No. 5–6, Ref., pp. 129–136, figs. 7*).

Report on artesian wells, L. Woolman (*Geol. Survey New Jersey Rpt. 1902, pp. 63–95*).—A collection of data regarding the artesian wells of the State, especially the southern portion, and a record of the more important wells drilled during 1902.

The sinking of subterranean waters and the disappearance of springs, E. A. Martel (*Compt. Rend. Acad. Sci. Paris, 136* (*1903*), *No. 9, pp. 572–575*).

Absorption of ammonia by sea water, J. Thoulet (*Compt. Rend. Acad. Sci. Paris, 136* (*1903*), *No. 7, pp. 477, 478*).

The Murray waters (*Agr. Gaz. New South Wales, 14* (*1903*), *No. 4, pp. 289–309, figs. 31*).—This is an extract from the report of the royal commission and deals with the amount and utilization of the waters of the Murray basin.

A preliminary investigation of the soil and water of the Fayoum Province (*Jour. Khediv. Agr. Soc. and School Agr., 4* (*1902*), *No. 5, pp. 184–188*).—Analyses with reference to alkali content of water, soils, and efflorescences are reported and discussed. Injury from excessive irrigation and defective drainage is pointed out.

On the influence of commercial fertilizers on the water-holding capacity of soils, E. Gross (*Ztschr. Landw. Versuchsw. Oesterr., 6* (*1903*), *No. 1, pp. 80–90, fig. 1*).—The rate of capillary rise of water in sandy soil poor in humus, loam, and humus loam, in cylinders 1 meter long and 10 mm. in diameter, as affected by potassium sulphate, nitrate of soda, superphosphate, and caustic lime mixed with the soil at the rate of 2 per cent is recorded. The results of duplicate tests are summarized in the following table:

Capillary rise of water in soils treated with different kinds of fertilizing materials.

Fertilizing material.	Sandy soil.		Loam.		Humus loam.	
	Rise of water in 21 days.	Rise, assuming unfertilized soil as 100.	Rise of water in 42 days.	Rise, assuming unfertilized soil as 100.	Rise of water in 42 days.	Rise, assuming unfertilized soil as 100.
Unfertilized	55.5	100.0	60.2	100.0	46.2	100.0
Potassium sulphate	62.8	113.1	68.0	112.9	55.5	120.0
Superphosphate	50.8	91.5	70.2	116.6	48.5	104.9
Nitrate of soda	39.8	71.7	55.5	92.1	39.2	84.9
Lime	31.0	55.9	32.0	53.1	32.0	69.2

Soil temperatures (*Colorado Sta. Rpt. 1902, pp. 200–204, 214–217*).—This is a tabulated record, prepared by R. E. Trimble, of weekly observations on soil temperatures at different depths in irrigated and unirrigated soil.

Investigation of Illinois soils, C. G. HOPKINS (*Illinois Sta. Circ. 64, pp. 26, figs. 5*).—A report of progress in the general and detailed soil surveys of Illinois carried on under State appropriations. More detailed accounts are to be published later in bulletin form.

The soil of the Bermuda Islands: Its origin and composition, A. E. VERRILL (*The Bermuda Islands. New Haven, Conn.: Author, 1903, pp. 78–82*).—In this article, which is part of a comprehensive treatise on the Bermuda Islands, published first in the Transactions of the Connecticut Academy of Arts and Sciences, volume 11, it is stated that "with the exception of the black peat or muck of the swamps and marshes, all of the soil of the islands has been produced as an insoluble residue, or impurity, left after the solution of the limestones and shell-sands of the islands by rain water, but it is usually mixed with more or less disintegrated limestone, and some organic matter. . . . Where the decomposition has been complete, this soil is a reddish clay, the color being due to an excess of iron oxid, but in most places the clay soil is mixed with considerable shell-sand, or grains of undecomposed rock. In many places the latter forms the greater part of the bulk." The latter are the so-called white soils composed largely of calcium carbonate. The historical record of crop production in the islands as well as the analyses reported in this article show the soils to be as a rule naturally very fertile. They have, however, been reduced by years of exhaustive culture. According to the analyses reported the red soils, which are the more important, contain lime, 3.6 to 10 per cent; potash, 0.11 to 0.17 per cent; and phosphoric acid, 0.68 to 0.74 per cent.

On the nature of the nitrogen compounds found at different depths in the soil, G. ANDRÉ (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 26, pp. 1353–1355*).—The total and ammoniacal nitrogen obtained by boiling (for 15 hours) samples of soil taken in April and October from the surface and from depths of 30 and 60 to 65 cm. in dilute hydrochloric acid (36 per cent) and potash solution (containing 20 times as much potash as there was nitrogen in the sample of soil) are reported. In case of the treatment with potash the ammonia was removed by means of a current of hydrogen and collected in dilute acid. The results indicate that the insoluble nitrogenous compounds of the surface soil are largely transformed into soluble compounds during the summer and are widely diffused through the deeper layers of the soil during the winter, so that in the spring the lower layers of the soil contain more soluble nitrogen than the surface soil. At the end of summer, however, the distribution is quite uniform in the different layers.

The analysis of reh, the alkaline salts in Indian usar land, E. G. HILL (*Proc. Chem. Soc.* [*London*], *19* (*1903*), *No. 262, pp. 58–61; abs. in Chem. Centbl., 1903, I, No. 17, p. 987*).—The upland usar or alkali lands of India, covering an area of about 2,000,000 acres, mainly between the Jamna and Ganges and also between the Ganges and Gogra, are described, and the attempts to utilize them are referred to. Analyses of 5 samples of the soluble salts or reh are reported and their possible utilization on a large scale is discussed. None of the samples examined contained less than 88 per cent of sodium carbonate.

Investigations on the influence of the volume of soil on the yield and composition of plants, O. LEMMERMANN (*Jour. Landw., 51 (1903), No. 1, pp. 1–40*).—The yield and composition of mustard grown on mixtures of sand and ordinary soil under different systems of manuring in series of pots containing 30, 22½, and 15 kg. of soil are reported and discussed. The results show that both the yield and composition were affected by the size of the pot, the fertilizer apparently being more thoroughly utilized and the yield being larger in the larger pots.

Nitrification in different soils, W. A. WITHERS and G. S. FRAPS (*North Carolina*

Sta. Rpt. 1902, pp. 31–41).—In continuation of previous work (E. S. R., 13, p. 122), a study was made of the rate of nitrification of ammonium sulphate and cotton-seed meal in 8 soils of known history from different parts of the United States. The results show that "calcium carbonate exerts a decided accelerating influence upon the nitrification of cotton-seed meal and ammonium sulphate, especially the latter. In some soils a greater per cent of nitrogen is nitrified in the form of ammonium sulphate than in cotton-seed meal; in other soils the contrary is the case, even in the presence of calcium carbonate. Other soils exhibited little nitrifying power, under the conditions of the experiments."

FERTILIZERS.

Manures in use in Egypt, G. P. Foaden (*Jour. Khedir. Agr. Soc. and School Agr., 5 (1903), No. 1, pp. 1–34*).—Attention is called to the increasing need for fertilizers in Egypt and the limited supply at hand. In addition to Nile mud, the principal fertilizers available are sebach beladi (barnyard manure), sebach coufri ("the remains of ancient villages mixed with débris of various kinds and organic matter"), tafla or marog (a blue nitrate-bearing clay or marl), pigeon manure, and minor products, such as those derived from sewage, refuse from slaughterhouses, tanneries, street sweepings, etc. The value and use of these manures, as well as of commercial fertilizers, are discussed. Nile water contains on an average in August 170 parts of suspended matter per 100,000, 130 of which is deposited on the soil. This deposit contains on an average 0.1 per cent nitrogen, 0.2 per cent phosphoric acid, 0.6 per cent potash. The sebach coufri generally contains less than 0.3 per cent of nitrogen, 0.5 per cent of phosphoric acid, and 1 to 3 per cent of potash. The tafla or marog is very variable in composition, the content of nitrate of soda varying from 1 to 24 per cent. The average barnyard manure of Egypt contains nitrogen 0.3 per cent, phosphoric acid 0.2 per cent, potash 1.5 per cent.

The results of preservation experiments with barnyard manure stored in heaps, Bachmann (*Deut. Landw. Presse, 30 (1903), Nos. 36, pp. 311, 312; 37, pp. 323, 324*).—Heaps of 1,200 to 1,800 kg. were experimented with. In different cases the heaps were (1) loosely made, (2) closely packed, and (3) closely packed and treated with superphosphate (1½ per cent), phosphoric acid (1½ to 2 per cent), sulphuric acid, marl, ground calcium carbonate (5 per cent), and lime (5 per cent). After standing 4 months manure was removed from each of the heaps for comparative experiments on potatoes and beets. The changes in composition (water, total nitrogen, and ash) after 4 and 8½ months are reported. The loss of nitrogen was rapid for 3 months in the loose heap and then ceased. The loss in closely packed heaps covered with earth was as large as in the loosely made heaps. The superphosphate, phosphoric acid, and sulphuric acid reduced the loss of nitrogen, sulphuric acid apparently being most effective in this respect. Marl, calcium carbonate, and lime increased the loss of nitrogen. The manure treated with superphosphate gave the highest yields, followed in order by that treated with lime, phosphoric acid, calcium carbonate, marl, and sulphuric acid. The results in general show that the larger proportion of the loss of nitrogen occurs in the early stages.

Valuation of unexhausted manures obtained by the consumption of foods by stock, J. A. Voelcker and A. D. Hall (*Jour. Roy. Agr. Soc. England, 63 (1902), pp. 76–114, figs. 3*).—A revision of Lawes and Gilbert's tables using current values of nitrogen, phosphoric acid, and potash in common fertilizers; paying for ½ of the nitrogen, ¾ of the phosphoric acid, and all of the potash in the purchased foods; and reducing the period over which the manure is supposed to produce an effect from 8 to 4 years, the compensation value for the second, third, and fourth years being one-half of that of the year immediately preceding.

The wide variation in the effect of green manures plowed under at different times, Causemann (*Deut. Landw. Presse, 30 (1903), No. 31, pp. 263, 264*).—The yield of the following crop of rye on light sandy soil was in every case larger when lupines were turned under September 28 than when turned under July 31.

Phosphorus versus lime in plant ash, P. Q. Keegan (*Nature* [*London*], *66* (*1902*), *No. 1722, p. 655*).—Analyses of the ash of the leaves of a number of plants are reported in support of the view that a certain proportion of lime in the soil (say 3 or 4 per cent) interferes with the assimilation of phosphorus and is so inimical to the life of certain so-called calcifugous plants which require a definite amount of phosphorus for the healthy performance of their physiological functions.

An unusual result of fertilizing on a sandy moor soil, Clausen (*Jour. Landw., 51* (*1903*), *No. 1, pp. 77–80, fig. 1*).—Pot experiments are reported in which the yield of grain of oats was much larger and of straw smaller in case of fertilizer containing no phosphoric acid than in one containing that element. The experiments are to be repeated.

Results of experiments with potash fertilizers on moor meadows, Bachmann (*Fühling's Landw. Ztg., 52* (*1903*), *No. 7, pp. 251, 252*).—A comparison of kainit and 40 per cent potash salt in which the results favored the latter, both as fall application and as spring application. Applications of lime were apparently more beneficial in case of the kainit than in case of the other salt.

On potash and on alkaline phosphatic nitrogenous bone fertilizer, J. B. Sobrinho (*Bol. Agr. São Paulo, 3. ser., 1902, No. 12, pp. 801–806*).—This article discusses the sources of potash and describes the method devised by Ilienkoff and Engelhardt of the agricultural-chemical institute of St. Petersburg for preparing bone fertilizer by treatment with caustic potash.

The manufacture of animal fertilizers (*L'Engrais, 18* (*1903*), *No. 15, pp. 353–355*).—The preparation of fertilizers from by-products of tallow refining, from poudrette, dried meat and blood, and ground bone is discussed.

Commercial fertilizers, H. A. Huston and W. J. Jones, Jr. (*Purdue Univ. Spec. Bul., Mar., 1903, pp. 40*).—"This bulletin contains the detailed report and summary of fertilizer inspections made in 1902, the full text of the Indiana fertilizer law, a list of manufacturers who have registered raw materials (nitrogen and potash compounds), and a list of all fertilizers registered that were on sale April 1, 1903." Analyses of 679 samples are reported.

Analyses of commercial fertilizers, W. C. Stubbs (*Louisiana Stas. Bul. 73, 2. ser., pp. 1–173, 177–189*).—This bulletin gives the text of the State fertilizer law; statistics of the fertilizer trade in Louisiana; brief notes on the sources of fertilizing materials, the purchase and valuation of fertilizers; and tabulated analyses of several thousand samples of fertilizing materials, including mixed fertilizers, acid phosphates, cotton-seed meal, bone, tankage, dried blood, nitrate of soda, sulphate of ammonia, muriate of potash, sulphate of potash, kainit, bat guano, slag, floats, and boneblack.

Inspection of fertilizers in 1902 and analyses of wood ashes and miscellaneous fertilizing materials, F. W. Morse et al. (*New Hampshire Sta. Bul. 97, pp. 12*).—Analyses of 81 brands of fertilizers inspected in cooperation with the State board of agriculture and 9 samples of ashes, 2 of superphosphate, 1 each of South Carolina floats, ground bone, tankage, cotton waste, nitrate of soda, and sulphate of potash, 2 of insecticides, and 5 of muck, are reported. The text of the fertilizer law which went into effect in 1901 is given.

Some facts about commercial fertilizers in New York State, L. L. Van Slyke (*New York State Sta. Bul. 230, pp. 18*).—This bulletin discusses the importance of the fertilizer trade in the State and points out "how better economy may be realized in purchasing plant foods." The recommendations include (1) the purchase of high-grade fertilizers, and (2) the purchase of unmixed materials. The more economical sources of phosphoric acid, potash, and nitrogen are pointed out, and illustrations are given of 3 types of plant food mixtures.

Fertilizer analyses, fall season, 1902, B. W. KILGORE (*Bul. North Carolina State Bd. Agr., 24 (1903), No. 2, pp. 43-56*).—Analyses and valuations of 194 samples of fertilizers are reported.

Fertilizer analyses, spring season, 1903, B. W. KILGORE (*Bul. North Carolina State Bd. Agr., 24 (1903), No. 3, p. 31*).—This bulletin reports analyses and valuations of 59 samples of fertilizers.

Analyses of commercial fertilizers, J. L. HILLS and C. H. JONES (*Vermont Sta. Bul. 98, pp. 27-48*).—This bulletin gives the main provisions of the fertilizer law as amended by the general assembly of 1902, discusses the valuation of fertilizers, and reports analyses and valuations of 39 samples of fertilizers. A table showing the average composition of different brands examined during the past 5 years is given.

A consideration of water in its relation to the fertilization of the soil, with some analytical studies of the mud of the River Piave, R. ONOR (*Staz. Sper. Agr. Ital., 36 (1903), No. 2, pp. 107-132*).

FIELD CROPS.

Report of the agriculturist, A. H. DANIELSON (*Colorado Sta. Rpt. 1902, pp. 131-136*).—Brief outlines of the different kinds of experimental work with field crops conducted at the station are given. In cooperation with this Department experiments are conducted with sugar beets, grasses and forage plants, and grains, including winter wheats. The other experiments comprise culture and variety tests with wheat, spelt, emmer, einkorn, alfalfa, brome grass, and field beets. Fertilizer tests with nitrate of soda for wheat and oats are also in progress.

Forage crops, grasses, alfalfa, clovers, etc., W. R. DODSON (*Louisiana Stas. Bul. 72, 2. ser., pp. 95, pls. 8*).—Notes are given on the present status and methods of cultivation of a large number of forage plants, including alfalfa, cowpea, Spanish peanuts, lespedeza, red clover, crimson clover, white clover, soy bean, burr clover, velvet bean, hairy vetch, beggar weed, various varieties of sorghum, oats, winter barley, rye, Bermuda grass, carpet grass, large paspalum, crab grass, Italian rye grass, teosinte, redtop, smut grass, Johnson grass, barnyard grass, switch cane, rescue grass, meadow barley, corn stover, dwarf Essex rape, and cassava. The cultivation of alfalfa is gradually becoming more extensive in Louisiana, especially along the Red River bottoms where very favorable conditions are found. The bulletin contains a copy of a paper on alfalfa read before a farmers' institute by W. L. Foster. Experiments with velvet bean showed that both as a forage and a fertilizer crop this plant is fully equal if not superior to cowpea.

Experiments with phosphatic fertilizers in 1900-1901, O. REITMAIR (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 2, pp. 95-194, map 1*).—The results of extensive cooperative tests with phosphates conducted throughout Austria are given in tables. The method of conducting these tests is described, the use and value of phosphoric acid is discussed, and the general effect of this element in different forms is pointed out. The normal application consisted of 60 kg. of phosphoric acid per hectare. In all tests sulphate of ammonia furnishing 26 kg. of nitrogen and 40 per cent potash salt furnishing 42 kg. of potash per hectare were used.

Winter rye was much more responsive to phosphates than winter wheat. Of the different forms for wheat and rye superphosphate was the most effective. Comparing the results obtained with rye Thomas slag ranked very close to superphosphates in effectiveness and proved even more profitable. These 2 forms were closely followed by Algerian and Belgian phosphates. Of the phosphoric acid furnished in superphosphate 8.2 per cent was utilized by the crops, and of the quantity given in the other 3 forms 7 per cent was used. Doubling the application of Algerian phosphate gave but a slight increase in yield and was not profitable. The effect of the crude phosphates on rye was quite marked but on wheat it was very slight. From the results with rye the author concludes that 60 kg. of phosphoric acid per hectare is beyond the optimum for all the phosphates used. Winter rye utilized on an average 20 kg. of phosphoric acid per hectare. The quantities taken up by the crop on different plats varied considerably. Owing to this variation in the results with rye and to the limited number of tests with wheat no definite applications are recommended.

The progress of absorption of nitrogen by cereals, J. Henry (*Bul. Agr. [Brussels], 19 (1903), No. 1, pp. 154–156*).—A record is given of the growth, weight, and nitrogen content of barley, wheat, and rye at different periods, which shows that the absorption of nitrogen varies widely at different stages. Two periods of maximum absorption were observed in case of wheat, viz, from May 7 to 17 and at the time of the formation of the grain. Similarly for rye the periods of greatest absorption were April 19 to 29 and June 11 to 26 (the time of formation of grain). In case of barley the maximum absorption was at time of heading, June 12 to 26.

Review of agricultural experiments, A. P. Aitken (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 15 (1903), pp. 94–134*).—This is a review of experiments in agriculture which are being carried on by various institutions in Great Britain, with a view to showing the amount and source of this work, the direction it is taking, and the progress which is being made. Special attention is called to the lack of knowledge regarding the soils of the country, and the way in which this affects the experimental work and its interpretation.

Corn experiments in Illinois (*Illinois Sta. Circ. 66, pp. 14*).—This is a report of progress on the different lines of investigation with corn which have been carried on under State appropriations at the station.

The acidity of corn silage, F. W. Morse (*New Hampshire Sta. Bul. 96, pp. 115–117*).—Analyses are given of several samples of corn silage made from different varieties of corn and analyzed at different times during the years 1895 to 1899. The average total acid content of samples of Sanford corn silage varied from 1.5 per cent acetic acid in 1895 to 1.95 per cent in 1897. With Leaming corn the variations ranged from 0.67 per cent in 1896 to 1.47 per cent in 1897. The average of 5 samples of Mosby Prolific, taken between March 17 to 31, 1896, was 0.82 per cent. Analyses in 1899 of silage made from Leaming corn showed that the acidity of the surface silage was usually lower than that of the silage 6 or 8 in. below the surface, the average results being 0.83 per cent for surface silage and 1.03 per cent acetic acid for silage not less than 6 in. below the surface.

Cotton culture, R. J. Redding (*Georgia Sta. Bul. 59, pp. 221–250*).—Experiments similar to those conducted in previous years are reported (E. S. R., 13, p. 1038). In 1902, 26 varieties were under test. Moss Improved, Peterkin Improved, Schley, Allen Prolific, Texas Bur, Woodfin Nonpareil, and Prize, given in the order of their value of total products, head the list in profitable returns, their values ranging from $31.22 to $35.02 per acre. The first 5 varieties mentioned ranked in the same order in the production of lint cotton. Considering the general results for the last 9 years in this line of work, large bolls, large seeds, and a high percentage of lint are closely related to the greatest value of lint and seed. Brief notes on some of the varieties under test are given with directions for selecting a variety and for selecting seed in the field.

As in previous years, a mixture of an early and a late maturing variety was tested. The varieties used this season were Schley and King Improved, of which 15.5 and 10 lbs. of seed per acre, respectively, were planted. King Improved, the early variety, yielded much less than Schley and the mixture was also found unprofitable. Average results for 5 years show that the yields per acre of medium varieties were 90 cts. greater in value than the yields of early varieties, while the yields of the mixtures exceeded those of the medium varieties by $1.34. If the 2 varieties are equally productive from year to year it is considered expedient to mix them.

The results of distance experiments conducted for 4 years are in favor of spacing plants 12 in. apart in 4-ft. rows. This test had reference only to the distance between plants in the row. From a series of experiments the author concludes that on upland middle Georgia soils, capable of yielding 800 to 1,200 lbs. of seed cotton per acre, the rows should not be wider than 36 in. and the plants in the row not over 12 in. apart.

An unfavorable season and the appearance of rust interfered with the results of a fertilizer test made for the purpose of determining the best proportion of nitrogen in a mixture containing available phosphoric acid and potash in the constant proportion of 4 : 1. As the nitrogen was diminished in the applications the phosphoric acid and potash were increased to the extent of making the money value of the application uniform in all cases. The general application of nitrogen was given in the form of cotton-seed meal, but in each case 15.6 lbs. of nitrate of soda were applied when the seed was planted. The experiment was made in duplicate. Where cowpea vines had been turned under before planting to cotton the crop practically escaped injury from rust. In a general way, the results of one experiment indicated that the yield increased quite regularly as the supply of nitrogen was diminished. In the duplicate test lack of moisture interfered with the results.

In the second fertilizer experiment potash in the form of muriate was successively diminished and the quantity of acid phosphate and cotton-seed meal correspondingly increased so that in all cases the cost of the fertilizer amounted to $4.17 per acre. In this test the fertilizers were practically without effect.

The weather conditions during the growing season for a series of years are tabulated. Fertilizer formulas for various crops on different kinds of soils are given in an appendix.

Cotton culture, J. S. Newman (*South Carolina Sta. Bul. 75, pp. 13, figs. 3*).—Popular directions are given for the culture of cotton in South Carolina.

Peas and the pea weevil, C. A. Zavitz and W. Lochhead (*Ontario Agr. Col. and Expt. Farm Bul. 126, pp. 32, figs. 9*).—This bulletin contains a summarized account of the cultural work with peas at the Ontario Agricultural College, together with the results of experiments in the control of the pea weevil. The pea weevil is described in detail and a map given showing the present distribution of this insect in Canada. More than 100 varieties of peas have been grown in the experimental grounds at the college during the past 14 years. A table is given showing the character of the vines as regards growth and susceptibility to weevils, yield, etc., of 26 leading varieties for a period of 7 years.

Some varieties of peas, like New Canadian Beauty, are double in size those of other varieties like Common Golden Vine, and hence in seeding it has been found necessary to vary the amount sown from 2 to 3½ bu. per acre. The time of maturity has varied for 26 varieties from 94 to 101 days and the extremes in length of vines from 19 to 52 in. The yields per acre have varied from 23 to 38 bu. The average weight per bushel has been 59.4 lbs. for whole peas. Weevilled peas varied in weight from 38 to 52 lbs., and usually the smaller the peas the greater amount of injury done by weevils. The best yielding varieties for the whole province, averaging upward of 25 bu. per acre, are the Egyptian Mummy, Chancellor, Prussian Blue, and Striped Wisconsin Blue. Other varieties averaging between 24 and 25 bu. per acre are Early Britain, Canadian Beauty, and Canada Cluster. The reports of experimenters show that with but few exceptions there are no pea weevils north and east of a line drawn from Brockville to Midland.

Experiments for a number of years in selecting large and small seed of the same variety resulted in an average yield of 30.3 bu. of grain and 1⅓ tons of straw per acre for large seed as against 23.9 bu. of grain and 1.1 tons of straw per acre for small seed. Using the split pea seed as it came from the thrasher in comparison with whole seed, the average yields were 10 bu. of grain for the former and 30.7 bu. for the latter. Only about 30 per cent of weevilly peas were found to germinate. In seeding peas at different dates between April 18 and May 23, the average yield for the former date was 21 bu. per acre and for the latter 9 bu. per acre. There has been an average increased yield in 30 experiments of 1.3 bu. per acre from seeding peas in drills rather than broadcasting.

Peas were grown in combination with a number of different crops for both forage and grain. The average results of 6 years' experiments with 11 different mixtures indicated peas and oats in the proportion of 2 bu. of oats to 1 bu. of peas as the best mixture. The best results as to fodder were obtained when the Siberian oats and Prussian Blue peas constituted the mixture. In cooperative experiments with farmers throughout Ontario for a period of 5 years, a mixture of tares and oats has exceeded in yield a mixture of peas and oats by about 600 lbs. of green fodder per acre, and it is therefore recommended that in those portions of the province where the pea weevil is troublesome spring tares be used instead of peas to mix with oats. Where peas and oats are grown together for green fodder in weevil-infested districts it is recommended that the crop be cut when the peas have reached the blossoming stage. As regards the yield of grain of several different mixtures, the best results were obtained from a mixture of oats and barley. Peas have been seeded with oats as a pasture crop for cattle, but without very satisfactory results, the oats being eaten much more readily than the peas. The mixture, however, is believed to be very suitable for either sheep or swine. The value of peas as a green manure for wheat is shown in the average results obtained during the period of 4 years in which wheat grown after peas averaged 36.1 bu. per acre, after rape 30.4 bu. per acre, and after buckwheat 29.6 bu. per acre.

Grass peas have proved perfectly resistant to the weevil in Ontario and have yielded at the rate of about 25.7 bu. of grain and 2.2 tons of straw per acre. One year the yield was slightly over 43 bu. per acre. From the average results of 27 cooperative experiments conducted throughout Ontario in 1901, the Grass pea yielded about ¾ bu. per acre less than the Early Britain variety and ½ bu. more than White Wonder variety. The yield of forage has been about the same as that obtained from common tares. The Egyptian or chick-pea (*Cicer arietinum*) has been grown at the station, yielding at the rate of about 35.6 bu. of grain and 1 ton of straw per acre. This grain is slow in reaching maturity and the straw is of poor quality.

Directions are given for destroying the pea weevil by the use of carbon bisulphid, and it is recommended that the growing of both field and garden peas be discontinued for at least 2 years in those districts where the weevil is now abundant, and that such crops as Early Yellow soy beans, Grass peas, emmer, mixed grains, etc., be substituted.

Experiments with oats, Aberdeen, 1901-2, J. Wilson and W. M. Findlay (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 15* (*1903*), *pp. 183-196, figs. 9*).

Sisal, the Yucatan fiber, E. H. Thompson (*Amer. Inventor, 10* (*1903*), *No. 12, pp. 239-241, figs. 13*).—An account of the culture and the manufacture of fiber from sisal.

Sugar-beet investigations in Illinois, C. G. Hopkins and L. H. Smith (*Illinois Sta. Circ. 62, pp. 6*).—This is a brief report of progress on cooperative experiments with farmers throughout the State and on investigations at the station.

Macaroni wheat in South Dakota, E. C. Chilcott (*South Dakota Sta. Bul. 77, pp. 3-28, pl. 1, figs. 2*).—In addition to reporting experimental results this bulletin describes macaroni wheat and discusses its adaptability to South Dakota and its present and prospective market.

A list of farmers who entered into a cooperative culture and variety test with macaroni wheat is given, together with extracts from reports on the results obtained by the different parties. At the station in 1901, 12 varieties of macaroni wheat yielded on an average at the rate of 21 bu. 26 lbs. per acre as compared with 10 bu. 33 lbs. for 9 varieties of bread wheats. In 1902 the results in yield were also largely in favor of the macaroni wheats, but the conditions this season did not warrant definite conclusions; the bread wheats being later than macaroni wheats were more subject to rust attacks. In several cases the same variety of macaroni wheat gave widely different results on different plats.

The general conclusions drawn from the results are that macaroni wheats are adapted to South Dakota, produce greater yields than Blue Stem and Fife wheats, and are more drought resistant than bread wheats. The following varieties have given good results: Pellissier, Berdiansk, Kubanka, Arnautka, Gharnovka, Yellow Gharnovka, Taganrog, Argentine, Medeah, Velvet Don, and Black Don.

Wheat and milling, A. GIRARD and L. LINDET (*Le froment et sa mouture. Paris: Gauthier-Villars, 1903, pp. VII + 355, pls. 6, figs. 82, dgms. 3*).—A comprehensive work treating of the composition, storage, and milling of wheat, as well as the nutritive value of wheat and its milling products and related topics.

HORTICULTURE.

A selected list of vegetables for the garden, F. W. RANE (*New Hampshire Sta. Bul. 99, pp. 25–43, figs. 18*).—As a result of experimentation the author has compiled a list of vegetables for culture in New Hampshire. This list is as follows:

Green-Pod Bush Beans.—Giant Stringless Green-Pod Valentine, Stringless Green-Pod, Early Six Weeks, Dwarf Horticultural. *Bush Wax Beans.*—Wardwell Kidney Wax, Currie Rust-Proof Wax, Market Wax. *Lima Beans.* Bush Lima Beans. *Beets.*—Eclipse, Crosby Egyptian, Arlington Favorite. *Cabbage.*—Early Spring, Winningstadt, Early Summer, Succession, Lupton. *Carrots.*—Danvers Half-Long, Chantenay. *Cauliflower.*—Snowball, Erfurt. *Celery.*—Golden Self-Blanching, Boston Market, Pascal. *Sweet Corn.*—Early Cory, Crosby Early, Potter Excelsior or Squantum. *Cucumbers.*—White Spine. *Eggplant.*—New York Improved Large Purple. *Lettuce.*—Big Boston, New York or Wonderful, Grand Rapids, Crumpled Leaf. *Muskmelon.*—Emerald Gem, Rockyford or Netted Gem, Montreal, Long Yellow. *Watermelon.*—Cole Early, Boss, Black-Eyed Susan. *Onion.*—Yellow Danvers. *Parsnip.*—Hollow Crown. *Early Peas.*—Gradus or Prosperity, Claudit, Nott Excelsior. *Late Peas.*—Telephone, Stratagem. *Peppers.*—Sweet Mountain, Large Bell or Bull Nose, Improved Thick Long Red. *Potatoes.*—Early Rose, Delaware, Green Mountain, Washington. *Pumpkin.*—Small Sugar, Golden Oblong. *Radish.*—Early Scarlet Globe, French Breakfast, Wood Early Frame. *Squash.*—Early Prolific Marrow, Essex Hybrid, Warren, Hubbard. *Tomatoes.*—Earliana, Dwarf Champion, Stone, Beauty. *Turnip.*—Early Milan, Early Snowball, White Egg, Red Top Globe. *Swedes or Ruta-Baga.*—American Purple Top Ruta-Baga.

Cultivation of vegetables, and notes on varieties, G. COOTE (*Oregon Sta. Bul. 74, pp. 20*).—Popular directions are given for the culture of onions, peas, string beans, Lima beans, horse or broad beans, vegetable marrows, cauliflower, and broccoli. Notes on the behavior of varieties of these vegetables when grown at the station are included. Lima-bean seed grown at the station gave stronger and more productive plants than seed of the same variety obtained from an Eastern seed firm.

Report of the horticultural division, W. F. MASSEY (*North Carolina Sta. Rpt. 1902, pp. 18–28*).—This is a brief review of experiments with grapes, tomatoes, lettuce, roses, potatoes, sweet corn, bulbs, and cantaloupes.

Cucumbers under glass, G. E. STONE (*Massachusetts Sta. Bul. 87, pp. 3–29, 42, 43, figs. 9*).—A discussion of the botany of the cucumber seed, types of cucumber houses with estimates as to their relative economy, importance of light in cucumber culture, and the details of forcing, including varieties, temperature, watering, transplanting, pruning, pollination of flowers, etc. Relative to houses the author says: "The cheapest and most economical house to build and operate in the production of cucumbers is an even or two-thirds span house of large dimensions, such as is most frequently used by lettuce growers. The construction, heating, and management of a large house are proportionally cheaper than of a small house."

The variety of cucumber chiefly grown is the White Spine or some similar sort, though in many instances a cross between White Spine and the English forcing variety Telegraph is used. Giant Pera sometimes crossed with White Spine does not produce a desirable hybrid. A night temperature of 65° and a day temperature of 85° F. is considered the most desirable, and a higher temperature in sunshiny weather. Transplanted plants have not been found to grow faster or make better plants than plants grown directly in the seed bed. The results secured in experimenting on the effects of various amounts of light show a difference of 10 to 80 per cent in the maturity of cucumber plants caused by exposure to single, double, and triple layers of glass. These experiments and others in which the activity of starch development in the leaves of the plants on sunny days was observed, using first and second quality glass, clean and unclean glass, etc., brought out clearly the much greater carbon dioxid assimilation of the plants with every increase in the amount of light. Shadows caused by heavy frames or adjacent buildings retarded assimilation and gave rise to immature plants. With plants in the greenhouse 24 to 30 in. apart the author believes the 1-shoot system of training preferable to training 2 shoots.

In pruning experiments with White Spine, in which a single leader and several laterals were allowed to grow without pruning, "the average yield of fruit on the main shoot was 18 per cent higher than upon the laterals. The lowest laterals, or those nearest the base of the plant, came next in the production of fruit, and the others or higher laterals followed in uniform succession in fruit production. The fruit matured earlier upon the main shoot than upon the laterals, the lowest laterals more nearly approaching the main shoot in this respect, and the other laterals following in uniform succession. The main shoot showed a gain of 36 per cent in the length of time required to mature its fruit over the first lateral. Of the fruit formed on the laterals, 61 per cent occurred in first axils. The number of internodes between the successive formation of fruit on the plant was in the largest number of cases seven."

Considerable other data along this same line are given with 4 varieties in which the plants were allowed to develop a single leader and as many laterals as appeared, the laterals being pruned at the second leaf, or in case fruit did not set in the first axil of the lateral they were pruned just beyond the axil where it did set. In the latter experiments 93 per cent more pistillate flowers were found on the laterals than on the leader.

"Cutting the leader of the main shoot or pruning the laterals caused an increase in the number of laterals. Where laterals are not cut, they are not formed as a rule in the axil of every leaf. Pruning causes a larger amount of fruit to set in the first axils of the laterals, as it was found that in the experiment where pruning was practiced 91 per cent of the axils produced fruit, against 55 per cent where no pruning took place. In some instances where the leader was nipped on unpruned plants, this resulted in causing a slight increase in the amount of fruit in the first axil of the laterals. In conclusion it may be stated that from our experience the advantages of pruning seem to be an increase in the yield of fruit, and a concentration of fruit on the plant."

Notes are given on the lack of color in cucumbers, productiveness, and the vitality of cucumber seeds.

The origin of various varieties of American muskmelons, F. W. RANE (*New*

Hampshire Sta. Bul. 96, pp. 125–133).—The author has made a study of the origin and history of all of the well-known varieties of American muskmelons. A table showing the origin, introducer, and year of introduction of 54 varieties is given in the bulletin, together with a number of letters from various seed firms giving data and notes along the same lines. It was believed when the experiment was undertaken that a large number of American muskmelons would be found to be of definite origin. This belief was not substantiated. Very few varieties of known parentage were found. For the most part the varieties are chance seedlings or strains of well-known kinds.

From the notes obtained from seed firms it appears that the Green-fleshed Osage muskmelon came from a variety called Grand View, which in turn was an impure strain of Emerald Gem. Long Island Beauty is a variety of the Hackensack type originated on Long Island. Miller Cream was originated by John D. Miller, of Elmira, N. Y., in 1878, and is believed to have been a cross between Sill Hybrid and Cassava. Osage is believed to be an improved selection from Miller Cream. Osage Gem was a cross between Osage and Netted Gem. Paul Rose is a selected form of Osage. The winter muskmelons Eden, Khiva, and N. E. Hansen have been brought to prominence chiefly through the influence of J. F. Brown, of Utah. Ideal was originated by Professor Price of the Texas Agricultural College and Station.

Onion growing in the Cache la Poudre Valley, W. PADDOCK (*Colorado Sta. Bul. 81, pp. 10, figs. 3*).—A popular discussion of the onion-growing industry in the Cache la Poudre Valley, dealing with soils, preparation of land, fertilizing, seeding, cultivation, irrigation, harvesting, markets, varieties, etc. Yellow Globe Danvers is practically the only variety grown. Sowing the seed in the seed bed and transplanting to the open field has not been found profitable in that section. The cost of growing the crop is estimated to be from $50 to $90 per acre, averaging probably about $60 per acre. The prices received vary from 65 to 75 cts. per 100 lbs. in the fall.

The tomato industry of the Arkansas Valley, H. H. GRIFFIN (*Colorado Sta. Bul. 78, pp. 20*).—This bulletin records the results of 3 years' experiments and observations with tomatoes in the Arkansas Valley, and gives suggestions on the culture of tomatoes, including irrigation, the control of pests, diseases, etc. At present 5 canning factories are located in the valley. These are not always fully supplied with tomatoes. Factors tending to lower yields in the valley are strong winds, aridity, dashing rains, and too late planting or planting on impoverished soil. As the result of experiments in 1900 it was decided that pruning the plants in field culture was not advisable. Plants started in the hotbed and transplanted to the field produced fruit earlier and gave a greater total yield than plants grown from seed sown in the field. The variety Perfection ripened fruit about 3 weeks earlier than Stone, and yielded heavier. Hail interfered with the station experiments of 1901. Observations in the neighborhood that year showed that the heaviest yields were obtained from plants set early in May rather than later. On one farm the crop on land manured with 9 loads of sheep manure per acre ripened fruit about 3 weeks earlier than where no manure was used. Strong, stocky plants grown at the station produced larger and earlier crops than plants that had not been transplanted before setting in the field, or plants grown from seed sown in the field. The author found that it required about 40 to 45 days after setting for the fruit to ripen.

The best results in tomato growing were found on virgin sandy soils. Much adobe is not desirable. Transplanting tomato plants is of no advantage unless done early enough to permit of an increase of the root system. A good stocky plant should be 6 to 8 in. high and about as thick as a lead pencil when set in the field. On well fertilized land plants should be set 4 ft. apart each way. In irrigation the greatest quantity of water should be applied when the fruit is growing. Too much water early in the growth of the crop produces a tender growth of yellowish color. Irrigation late in the season after the nights have become cold may retard ripening.

In a test of 17 varieties of tomatoes Beauty was the most satisfactory for canning purposes. It is an early variety, of good appearance and quality, and one of the most productive varieties grown. It also stands shipping well. Acme is a somewhat earlier variety and may be preferred for early shipment. Fordhook First is also considered a good early variety.

Fertilizers for market-garden crops, B. DYER (*Jour. Bd. Agr.* [*London*], *9* (*1903*), *No. 4, pp. 461–481*).—This work has been noted from another source (E. S. R., 14, p. 961).

Experiments in orchard culture, R. A. EMERSON (*Nebraska Sta. Bul. 79, pp. 33, figs. 12*).—This bulletin reports the results of (1) tests of various methods of orchard culture to determine the effects of each method on soil moisture and the growth of young orchard trees, (2) tests of cover crops to determine their effects on fall development and winter injury of young peach trees, and (3) tests of soil covers and of various amounts of soil moisture on the root killing of apple and cherry stocks.

In the first instance a young orchard set in the spring of 1901 was divided into 8 plats, each plat containing 30 apple, 12 cherry, 10 peach, 10 pear, and 14 plum trees. One plat was cropped with watermelons and kept cultivated throughout the season, another with pole beans, and one with corn. One plat was given clean cultivation throughout the two seasons of 1901 and 1902. Another was cropped with oats both seasons. Three plats were given clean cultivation during the early part of both seasons and then seeded, one to millet, one to oats, and weeds allowed to grow on the third. In addition to the above plats, a ninth smaller plat on which no trees were grown was seeded to rye to note the effect on soil moisture. During the season for the 4 months from May to August, inclusive, only a little over 7 in. of rain fell in 1901, while during the same period in 1902 28 in. fell.

In these experiments rye, during the first season, dried the ground most of all the different methods of cultivation. This plat became dry earlier and remained dry nearly a month longer than any other plat. Next to rye the oat crop dried the ground most seriously, though not to a much greater degree than did corn and cover crops. The oat plat became dry, however, about 2 weeks earlier in the season and the drought lasted much longer than on the corn plat. The soil in the cover-crop plats did not become dry for a week or two after the corn ground did. Clean cultivation dried the soil the least of any of the different methods of culture, while vegetables dried the soil but little more than clean cultivation. There was from two to three times as much moisture available to plants during the dry season in the clean cultivated plat as in the oat plat. Both the oat and cover-crop plats absorbed more moisture during heavy rains than the clean cultivated plat, but this was counterbalanced by the more rapid loss during periods of dry weather.

The effect of drought on the young orchard was especially noticeable on the oat plat, where more than 50 per cent of the trees died. On the other plats the loss varied from 2 trees on the clean cultivated plat to 5 where vegetables were grown, 7 on the corn plat, and 9 where cover crops were used, out of a total in each case of 76 trees set. Tables are given showing the average height and breadth of the top and diameter of the trunks of trees on the different plats.

In summarizing the results of these tables the author states that all things considered—drought killing, height of tree, breadth of top, and diameter of trunk—"the vegetable and clean cultivation plats rank first, the former being slightly ahead of the latter. The next in rank are the cover crop and corn plats, the former being very slightly ahead of the latter. The oats plat naturally ranks lowest, much lower than the corn and cover crop plats."

The serious drying effect of rye is noted in one other case where rye was seeded in a bearing orchard. During the summer of the drought only a few trees died, but the following season the spring was very dry, and although abundant rains came in

June all the trees in this orchard died of drought during one of the wettest seasons on record in Nebraska.

In the study of the effect of cover crops on fall development and winter injury of young peach trees, 2 orchards of 48 trees each were set, one orchard on bottom land and the other on upland. Both orchards were given clean cultivation up to about the middle of July each year, then each orchard was divided and one-third seeded to oats, one-third to millet, and the remaining third given clean cultivation throughout the fall. In 1901 all the trees on the upland stopped growth early in the fall and no great difference was noticeable in the maturity of the wood of the trees in the different plats. On the bottom lands the trees on the cover crop plats stopped growing about the middle of August, but growth was continued on the cultivated plat until much later. The following spring it was found that many of the trees on the bottom lands had been badly injured, half the trees on the late cultivated plats being dead and the remainder seriously injured. On the cover-crop plats about half the trees were badly injured, while the remainder were unhurt. Not a single tree was dead. About $\frac{1}{3}$ more trees were injured where oats were seeded than where millet had been used. None of the trees on the uplands was seriously injured by the winter's cold, though on the late cultivated plat nearly all the trees showed considerable brown coloration beneath the bark. The results secured in 1902 are not yet complete. They show, however, a better ripening of the wood on the cover-crop plats than on the cultivated plats.

In the third experiment 7 boxes, each 2 ft. square and 18 in. deep, were filled with loam soil of varied water content. In each box 25 apple and 10 cherry seedlings were planted. Six of the boxes were set outdoors about the middle of December. Hay was placed between and around the boxes and covered with soil. One box of trees was stored in a cool, dry cave. Of those left outdoors one box was covered with a mulch of straw 4 in. deep, one was protected with a covering of snow about 4 in. deep whenever snow fell, and the remaining boxes were left without any covering, snow being swept off when it came. The following February, when the boxes were examined, none of the cherry roots had been injured enough to prevent their growing, and there was practically no difference in the degree of injury in the different boxes. The apple roots, however, were considerably injured, the greatest injury occurring in the drier soils.

Out of 25 apple trees set in the unprotected box containing 10.4 per cent of moisture, 20 trees were dead and 5 injured. In the unprotected box containing 15.2 per cent of moisture, 19 trees were dead and 6 injured. In the box with a moisture content of 19.8 per cent, 3 were dead, 10 injured, and 12 uninjured. In an unprotected box containing 25.6 per cent of soil moisture, 8 trees were dead, 4 injured, and 13 uninjured. The box covered with the straw mulch contained 16 per cent of soil moisture, and none of the trees were dead in this box and but 7 injured. In the box covered occasionally with snow, and containing 15.8 per cent of moisture, 7 were dead and 8 injured. Not a tree was injured in the box stored in a cool, dry cave, though it contained but 10 per cent of soil moisture. This is believed to show that the winter injury to apple roots is not alone due to dryness of the soil, but to cold and dryness combined. The mulch was advantageous in preventing the alternate freezing and thawing which took place in bare soils. A record is given showing the depth of frost in bare ground and ground covered with a millet cover crop.

In conclusion, the author states that a cover crop is one of the best means for protecting the roots of trees from winter injury. Likewise any method of culture that leaves the ground moist in fall has an advantage over methods that leave the ground dry. In the station experiments the soil under cover crops that have been killed by early frosts has been as moist on the approach of winter as soils given clean cultivation throughout the fall. For the young orchard, thorough cultivation in early summer, followed by a cover crop in the fall, is advocated.

"Good cultivation in early summer can often be given young trees by growing some cultivated crop in the orchard. Tender crops are best, since they can not be sown so early as to dry the ground seriously in spring, and are killed by fall frosts, thus preventing very late drying. Cropping with corn, for instance, insures fairly thorough early cultivation, and corn is a fair substitute for a cover crop in fall and winter."

A study of Northwestern apples, N. E. HANSEN (*South Dakota Sta. Bul. 76, pp. 148, figs. 84*). -This bulletin discusses methods of propagating apples and of originating new varieties, best varieties of orchard and small fruits for planting in the Northwest, and the terms used in describing apples; and gives descriptions of more than 300 varieties of apples, including notes on their origin. A key or system of classification is proposed by means of which the names of unknown varieties of apples may be determined. The necessity of very hardy varieties of apples for the Northwest is discussed in some detail by the author, and the standing offer of the Minnesota State Horticultural Society of $1,000 to the originator of a variety of apple that shall be as hardy as the Duchess, equal in quality, size, and appearance to Wealthy, and possess the keeping quality of Malinda, is noted. As a stock for apples the station has found the Siberian crab (*Pyrus baccata*) perfectly hardy. The Russian Apple Nomenclature Commission, appointed in 1898 by interested societies in Minnesota, Iowa, Wisconsin, and South Dakota, of which the author was secretary, defined and described 14 groups of apples, strongly favoring Duchess, Hibernal, Charlamoff, Anisim, Yellow Sweet, Repka Malenka, Longfield, Cross, and Christmas as the best for the average planter. Since then a number of seedlings have arisen in the different States, but it will require a "test" winter such as that of 1884-85 before their hardiness can be fully determined.

In growing apples from seed the author has found that seeds obtained from cider mills should be separated from the pomace before planting, since the fermenting pomace contains an acid injurious to their germination. Clean seed washed from the pomace within 24 hours after pressing should be spread out to dry for a day or two, then mixed with moistened sand and buried in small boxes with holes in the bottom for drainage in well-drained spots in the garden over winter. The author has been most successful at the station in planting the seeds in beds 4 feet wide surrounded by boards a foot high and given half shade by means of a lath screen as soon as the seedlings appear above the ground. Fall planting 1 in. deep in rows 10 in. apart and heavily mulching over winter with coarse rotten manure is preferred. In discussing the reproduction of varieties the author quotes G. P. Peffer, originator of the Pewaukee, Peffer, and other varieties of apples, as holding that any apple will reproduce itself from seed if inbred by covering the blossoms to prevent access of pollen from other varieties.

South Dakota is divided by the author into 12 districts, and varieties of apples, plums, cherries, native fruits, raspberries, blackberries, currants, gooseberries, strawberries, and grapes are recommended for each section.

Propagation of plums, third report, F. A. WAUGH (*Vermont Sta. Rpt. 1902, pp. 249-260, figs. 5*).—The work here reported is in continuation of that of the two preceding years (E. S. R., 14, p. 43). The nursery work in 1900 consisted in propagating 5 different varieties of plums, each representative of a class, on 5 different stocks. The varieties used were Stoddard, Bavay, Chabot, Milton, and Newman, and the stocks Americana, Miner, Marianna, Peach, and Sand Cherry. Each variety was grafted on each stock, thus making 25 different lots. There were 60 grafts made in each lot. One-half of the grafts in each lot were planted in Vermont and the other half in Maryland. The grafts at the Vermont Station practically failed. This result taken in connection with other work indicates that nursery stock can not be profitably produced in Vermont. All the grafts produced a satisfactory growth in Maryland except Bavay, which was wholly unsatisfactory. Data on the growth of the tops and roots of the other varieties are recorded in detail. In general, trees on Miner roots were poor, while those on Peach and Sand Cherry were especially good. Milton and Newman showed the largest number of live trees on the different stocks and Chabot the least. The striking feature of the experiment was the excellent results obtained on Sand Cherry stock (*Prunus pumila besseyi*).

The root systems of the different stocks are illustrated and described, and the orchard characters of the trees noted. In the author's opinion too much stress has usually been laid on the value of fibrous roots in transplanting trees. Freshness and vigor should constitute the chief desiderata in the roots of the nursery tree. The root system of trees on Americana stocks was rather small, but vigorous and hardy, and the union with most plums, especially Americana varieties, was excellent. The root system of trees on Miner stocks was weak in every respect. There were no tap or fibrous roots, and the lateral branches were scattering and irregular. The best root system on the whole was found on Marianna stocks, while the union of this stock with most varieties was excellent. Fairly good root systems were produced on Peach stocks, but the union was generally poor. The Sand Cherry stocks, while used at the station for only a year, have given remarkably fine root systems.

A summary is given of the experiments made during the past 3 years with different stocks and varieties, from which it appears that Chabot makes a comparatively slow growth and nearly always gives a lower percentage of trees than any other variety. Americana roots make good unions and give comparatively stout, stocky trees which, however, are measurably dwarfed. Marianna stocks have generally given long, tall, sound trees but a low percentage of successful grafts, averaging but 32 as against 46 Americana and 44 Peach. Attention is called to the fact, however, that these results are averages and that actual quality and vigor of the stock often exert a greater influence than its botanical name.

A review of Americana plums, F. A. Waugh (*Vermont Sta. Rpt. 1902, pp. 260–265, pls. 4*).—Of the different groups of American plums, *Prunus americana* is considered by far the most important. The various types of American plums are briefly reviewed and their botanical names given, with the principal synonymy. At the present time there are about 200 named varieties of American plums. Many of these, however, are indistinguishable from each other. Lists are given containing the names of varieties of (1) proved value, (2) those of doubtful value requiring further test, and (3) culls or varieties which should be discarded.

The Japanese hybrid groups of plums, F. A. Waugh (*Vermont Sta. Rpt. 1902, pp. 265–267*).—In a previous report (E. S. R., 14, p. 44) the Gonzales group of hybrid plums containing Japanese blood was classified and named botanically. In the present report hybrids of the Japanese with the Americana and Simon plums are discussed. Hybrids between the Japanese and the Americana plums are classified as the Omaha group, using the variety of that name as the type of the group. The group is described and given the botanical name of *Prunus triflora rustica*. Hybrids of Japanese and Simon plums (*P. simonii*) are classified as the Wickson group and given the new name of *P. triflora recta*. In this group the variety Wickson is especially typical as regards fruit, and Bartlett as regards tree and foliage.

A résumé of what I know about my specialty—plums, J. W. Kerr (*Trans. Peninsula Hort. Soc., 16 (1903), pp. 41–44*).—The author states that wherever the peach is entirely hardy it is a very satisfactory stock for plums and that root grafting is incomparably superior to budding in propagating on this stock. The varieties Abundance and Chabot are considered the best of the Japanese or hybrid plums. Milton and Whitaker are considered the best among native plums. The author states that there is more profit in an acre of Milton plums than of any other variety.

Laying down of peach trees, W. Paddock (*Colorado Sta. Bul. 80, pp. 8, figs. 4*).—In many sections of Colorado peaches are destroyed 4 years out of 5 by late spring frosts. The methods of laying the trees down over winter and covering as a protection are described. The practice of laying down is begun on trees the first years they are set in the orchard. Some time in November after the leaves have fallen a circle of earth about 4 ft. in diameter is removed from around the tree. Water is then poured in and the tree worked back and forth until the roots are loosened and the tree bent to the ground in the direction of least resistance. The branches are then tied together and the tree covered with burlap held in place with earth. A light layer of earth is then thrown over the tree. As the blossom buds begin to open the following spring the covering is loosened to admit of light and air. The blossoms are exposed to the sun gradually and after all danger from frost is considered over they are raised to an upright position and held in place by a couple of props. In placing the trees in the upright position the ground is again watered and when wet enough the trees are raised without difficulty. Old trees can not be very successfully handled in this manner. The practice must be begun with the young trees and continued. It is stated that the process seems to be in no way detrimental to the health of the trees since they live as long and bear as much fruit according to the size of the top as those grown in peach sections. The author believes that by laying down the trees in winter according to the plan outlined, peaches may be grown in nearly all parts of Colorado.

A remarkable pineapple (*Queensland Agr. Jour., 12 (1903), No. 4, p. 254*).—A curious pineapple having the characteristics of the smooth-leafed Queen and the ordinary rough-leafed pine is described. The fruit is described as being full of seeds, the juice very abundant but of poor flavor.

A remarkable mango (*Queensland Agr. Jour., 12 (1903), No. 4, p. 254, pl. 1*).—A mango fruit having a kind of horned protuberance is described. The fruit is borne on a tree between 4 and 5 years old and yields quite abundantly. The description is accompanied by a full-page illustration of the fruit.

Report of central station at Ames, H. C. Price (*Trans. Iowa Hort. Soc., 37 (1902), pp. 219–221*).—Notes on the crosses made between varieties of apples, plums, and cherries, and on the distribution of orchard pollen among fruit growers. An experiment in stratifying whole fruits in sand out doors, stratifying the core of the apple containing the seed, and stratifying the seed after they have been removed from the apple resulted in favor of removing seeds entirely from the pulp before stratifying.

An Iowa plant breeder; some of his creations, H. C. Price (*Rural New Yorker, 62 (1903), No. 2776, pp. 277–279, figs. 3*).—An account, with illustrations and descriptions, is given of the varieties of crab apples, grapes, and dewberries originated by Newton K. Fluke in Iowa.

The influence of stock on scion, Leclerc du Sablon (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 10, pp. 623, 624*).—A pear grafted on a quince produces larger fruit and yields more abundantly than when grafted on pear seedlings. The author studied one of the causes of this phenomenon. He found that the reserve material accumulated during the autumn and winter in the trunk and limbs was considerably greater in the pear grafted on the quince than in trees grafted on pear seedlings. In the spring, therefore, when growth starts, the trees grafted on quince are better able to contribute to the formation of fruit a large quantity of food than trees grafted on pear seedlings. No cause could be assigned as to why more starch should accumulate in the trees grafted on quince than in the trees grafted on pear seedlings.

Hardiness of some grafted stocks, J. M. Guillon (*Rev. Vit., 19 (1903), No. 482, pp. 301–305, figs. 5*).—An account of the growth of several species of grafted stocks in shallow and deep soils.

Comparative structure of calluses in grafted plants, L. Daniel (*Rev. Vit., 19 (1903), No. 482, pp. 324, 325*).—A microscopical study of the calluses of a large number of grafted plants.

Grafting nutmegs (*Agr. News [Barbados], 1 (1902), No. 6, p. 84*).—Detailed directions are given for grafting nutmegs.

The white blackberry "Iceberg" (*Sci. Amer., 88 (1903), No. 19, p. 358, fig. 1*).—An account of the origination by Luther Burbank of a white blackberry. The fruit is white and of good quality, being as firm when ripe as Lawton. The plant is said to be very productive.

Unfruitful currants, Ewert (*Gartenflora, 52 (1903), No. 8, pp. 210–218, figs. 6*).—The author made an investigation of certain varieties of currants that flowered profusely but failed to produce fruits. The flowers were first examined as to the amount of nectar they might contain, when it was found that the amount of dextrose in flowers of unfruitful sorts was practically equal to that in fruitful varieties. The pollen of the unfruitful sorts was found to germinate in a 3 per cent sugar solution containing 1½ per cent of gelatin. The pistils of a large number of varieties were then examined and it was found that while the pistils of the unfruitful currants were practically as long as any of a number of other varieties, the width was very much less. Drawings are given showing the difference in the appearance of the stigmas of sterile and fruitful currants, and the opinion is expressed that the sterility in the case under observation was largely due to some malformation of the pistils.

Grafts in moss, R. C. de Briailles (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), Nos. 10, pp. 308–310; 11, pp. 326–333, figs. 4*).—An account of the handling of grape bench grafts. As soon as the grafts are made they are placed in boxes containing a layer of moistened moss and charcoal mixed in the proportion of 1 of charcoal to 3 of moss. A layer of this mixture about 10 cm. deep is placed in the bottom of the box. The grafts are then put in and surrounded with a layer of the mixture about 5 cm. thick. The top of the grafts are covered over with cut moss and charcoal 6 to 8 cm. deep. Boxes of grafts thus prepared when covered are ready for shipment. In the future care of these grafts the boxes are placed in warm rooms having a temperature of 30 to 35°. Within about 24 hours thereafter the buds begin to swell; in 4 or 5 days they lengthen rapidly, and within 8 days have a length of several centimeters. At this time the layer of moss over the grafts is removed completely and the condition of the growing buds noted. If all is going well a layer of recently prepared chopped moss and charcoal about 2 cm. deep is replaced over them. If any appear to be rotting these are left exposed for about 24 hours and then covered. If transpiration is taking place too rapidly in some portions of the box a thicker layer of moistened moss and charcoal is placed over them. The plants are watered by placing the boxes in a tank so that the water rises through holes in the bottom nearly up to the callus. The water should have the same temperature as the room. No water is applied above, since it is likely to cause mildew and rotting. Watering from below is practiced about every 8 days. Within 15 to 20 days the grafts will have become well calloused and a considerable leaf growth have appeared. The plants may be then hardened off as rapidly as desired and transplanted to the field.

Some of the advantages of growing grafts in moss rather than out of doors are as follows: The work of grafting is simplified, the grafts being put in boxes as soon as made and no tying required; a degree of vegetation is attained in 20 days that in outdoor practice would require about 2 months; a more perfect callus and union is obtained; disbudding of the stock is unnecessary.

Grape pollen and pollination, F. H. Hall, S. A. Beach, and N. O. Booth (*New York State Sta. Buls. 223 and 224, popular ed., pp. 8, pls. 2*).—This is a popular edition of these bulletins (E. S. R., 14, pp. 869, 870).

The use of plaster in viticulture: Its application in connection with manures, L. Grandeau (*Jour. Agr. Prat., n. ser., 5 (1903), No. 14, pp. 432–434*).—Experiments extending over a number of years are reported. These showed that applications of gypsum alone or in connection with barnyard manure largely increased the yield of grapes.

Direct shipments of grapes from Spain, A. E. Carleton (*U. S. Consular Rpts., 72 (1903), No. 272, pp. 81, 82*).—Notes on the shipment of fresh grapes from Spain to the United States and possibilities of the further development of this trade.

Fertilizing by means of leguminous plants applied to tea culture, A. E. KERKHOVEN (*Teysmannia, 13* (*1902*), *No. 1, pp. 15–21*).—The experiments first undertaken in 1899 have not been definitely completed, but the author gives the results of work done up to January, 1902. Small tea plantations were fertilized with various commercial fertilizers, with stable manure, and by planting with a native leguminous tree called "dadap." The results so far obtained indicate that the first effect of the planting of "dadap" in the tea plantations is injurious because of the shade, but that the subsequent influence is more beneficial than the heaviest application of stable manure. This is due to the nitrogen stored in the root nodules.

Experiments were also made to learn how the leguminous shade tree should be treated to minimize the injurious effects of the shade and at the same time to retain the advantages of the nitrogen-gathering properties of the tree. The best practice appears to be to prune the tree heavily, so as to reduce the shading and also to encourage the tree to renewed growth and thus extend the root system.

Observations were also made on the influence of leguminous shade trees on plantations of cinchona and Ledgeriana trees, and it was noted that when the plantations were shaded with Albizzia they remained in good health for a longer time than when not so shaded. The stems, though more slender, were longer and yielded more bark under shade than without it.—H. M. PIETERS.

Fruit storage experiments (*Illinois Sta. Circ. 67, pp. 3–10, 21–23, fig. 1*).—A report of progress is given on the cold-storage work with apples which is being carried on in Illinois under the direction of the station. An account of the construction of a cold-storage house, capable of holding 2,500 bbls. of fruit and of storing apples in cellars insulated for the purpose, has been previously noted (E. S. R., 14, p. 356). During the season of 1901–2, 2,000 bbls. of fruit were placed in the cold-storage house October 5 and 70 tons of ice put in the refrigerator. The temperature of the storage room fell rapidly after the ice was put in to about 33° F., and this temperature, or a little lower, was maintained throughout the experiment. The cost of storage per barrel of fruit up to April 23 (about 7 months) was 19.1 cts., or 30.9 cts. less than the usual charge for apple storage. Based upon these results it is estimated that the building if stored to its full capacity each year would pay for itself in 5 years.

The fruit in the building was examined from time to time during storage. Without exception the fruit kept well. "There was no scald, no withering. The fruit remained plump and in perfect condition, and the percentage of rotten fruits was very small." The results are believed to plainly show the utility of buildings of this character cooled by ice. "Commercial growers of apples can well afford to invest in similar houses and thus add greatly to their profits." The experiences in cellar storage in southern Illinois show pretty clearly that horticulturists can not afford to insulate a cellar for storing fruit. The earth is too good a conductor of both heat and cold. Fruit stored in these cellars was more or less wilted and the percentage of rot was quite high.

Experiments were made with Ben Davis and Winesap apples in storing at temperatures of 31, 33, 35, and 37° F. The Ben Davis variety kept better and scalded less at 31° than at any other temperature. The difference was not so striking with the Winesap variety, but was in favor of the lower temperatures.

Another problem investigated was the degree of maturity most suitable for picking apples to be held in cold storage. The results obtained indicate a great superiority in the keeping qualities of mature over immature fruit. The mature fruit in storage showed a much smaller percentage of rot, was less subject to scald, did not shrink as much, had better color, and better selling qualities when removed from storage.

Notes are given on an experiment in orchard drainage and fertilization under way, and of the growing of a number of different cover crops in the orchard.

Cold storage, H. T. GALPIN (*Jour. Soc. Chem. Ind., 22* (*1903*), *No. 6, pp. 346–348*).—A technical account of the use of different brines for producing cold and of the various problems involved in cold storage. Calcium chlorid is believed to be a much better solution for producing cold than common salt, and it has the further advantage of not freezing at even 50° below zero. A 30 per cent solution will freeze at about 54° below zero. For ice making, where a brine temperature of 10 to 20° F. is carried in a tank, a brine ranging from 12 to 18 per cent is all that is required.

Some remarks on the canning industry, and details of processing fruits and vegetables, W. B. Alwood (*Virginia State Hort. Soc. Rpt. 1902, pp. 202-216*).—A discussion of the importance of the canning industry, buildings and equipment, contracting for growth and delivery of crops, principles underlying the processing of canned goods, germs which cause fermentation and putrefaction, critical temperatures, and crops commonly canned in Virginia.

Report of the Nova Scotia School of Horticulture, F. C. Sears (*Rpt. Sec. Agr., Nova Scotia, 1902, pt. 1, pp. 70-90, figs. 8*).—A brief report is given of the work of the school during the year, with lists of orchard fruits and of the principal trees and shrubs, including climbers, roses, etc., planted at the school, and an account of various experiments in orchard culture and the treatment of apple canker. Crimson clover and tares have been found very effective orchard cover crops, as well as alfalfa. Twelve model orchards have been established in as many different counties in the province during the year. In 5 of these orchards experiments were made in cutting back the fruit trees at the time of setting in the orchard. Five trees in each orchard were pruned in the usual way and 5 allowed to grow without pruning. The results for the season were generally in favor of cutting back the limbs at the time of setting in the orchard. Some data are given showing the number of trees of different varieties of apples affected by canker, from which it appears that Ribston Pippin, Nonpareil, and King of Tompkins are specially subject to this disease.

The American carnation; how to grow it, C. W. Ward (*New York: A. T. De La Mare Printing and Pub. Co., Ltd., 1903, pp. 296, pls. 5, figs. 94*).—This is a comprehensive work on the culture of carnations in America. Various chapters deal with the origin and early history of the carnation, soils, fertilizers, greenhouse and field culture, diseases and insect pests, greenhouse heating and management, raising carnations from seed, cross breeding, etc. Sketches are given of methods of carnation culture in different sections of the country, with brief biographical sketches of 10 prominent carnation growers in those sections.

Breeding hybrid carnations, C. W. Ward (*Proc. New Jersey State Hort. Soc., 28 (1903), pp. 227-233*).—The author secured better results by breeding between varieties originating from a common source than between varieties of widely different origin. Working along this line, colors were definitely fixed and finally bred upon plants of definite habits of growth and freedom of bloom. The first colors fixed in the author's work were of the crimson varieties General Gomez, General Maceo, Governor Roosevelt, President Roosevelt, Octaroon, Creole Beauty, etc. For the purpose of systematic work, carnations were divided by the author into 10 different groups based on color. The crimson section has been so well fixed that good varieties can be produced from seed. Experimental crossing in the pink and white sections has resulted in fixing these sections fairly well, but attempts to fix the yellow and white variegated type, as well as the fancy and purple and blue sections, have not been very successful. The greater number of plants grown from cross-fertilized seed contain the dominant characteristics of both parents. In many instances 90 to 95 per cent of the seedlings held to the dominant color, and in some cases even 100 per cent held true to the color of both parents.

So far as the author has been able to judge "the pollen parent, apparently, has no positive determinating influence upon the color, the color of the seed parent prevailing fully as much in the progeny as that of the pollen parent. But where the desired color predominates in several generations of the ancestry of both parents it is comparatively easy to reproduce it. The seed plant also apparently has no positive determinating influence upon the habit."

In breeding carnations the continuation of a series of experiments was frequently interrupted by the production of plants producing neither pollen nor seed. Again, other plants might produce seed but no pollen, and vice versa.

The chief advancement in carnation culture during the past 70 years, in the author's opinion, has been in the improvement of cultural methods, and the growing of improved hybrids and varieties which do not burst the calyx in growing.

The fertilization of chrysanthemum flowers (*Rev. Hort.* [*Paris*], *75* (*1903*), *No. 9, p. 195*).—It is stated that chrysanthemum flowers with small heads will yield a larger quantity of seed than flowers with large heads. In hybridizing chrysanthemums it is believed that better results will be obtained if the plant employed as a mother has both large and small heads. Pollen should be taken from plants grown naturally, that is, not pruned or disbudded.

Soil for blue hydrangeas, E. ANDRÉ (*Rev. Hort.* [*Paris*], *75* (*1903*), *No. 3, pp. 55–57*).—Hydrangeas sometimes produce red and sometimes blue flowers. The reasons for this have not been definitely known. The author states that the soil coming from near Angiers and composed of granite, schist, sand, and considerable quantities of iron, and covered with a thick turf formed of decomposed vegetable matter, always produces blue hydrangeas. This soil is sold to horticulturists in different parts of France as a blue hydrangea soil. If, however, the roots of hydrangeas potted in this soil are permitted to permeate ordinary soil the flowers produced are likely to be of a red or dirty violet color. The author analyzed this soil, obtaining the following results:

Analyses of soil used for growing blue hydrangeas.

Physical analysis.	Percent.	Chemical analysis.	Percent.
Pebbly	21.00	Nitrogen	0.4103
Black silicious	61.80	Phosphoric acid	.1168
Clay	2.16	Lime	.0504
Calcareous	.09	Magnesia	.2000
Organic matter	7.55	Potash	.0850
Humus	.91	Soda	.0043
Water	3.49	Iron oxid	3.4100
		Sulphuric acid	.0857
	100.00		

It is seen that this soil is essentially silicious, very rich in organic matter and in humus, quite poor in nitrogen and phosphoric acid, and excessively poor in lime and potash. This analysis is believed to demonstrate that the presence of iron in the soil is not the only unique factor in the production of blue hydrangeas, but that there should be in addition an exclusion of lime. With the knowledge of the composition of soil in which blue hydrangeas flourish, it is now believed that it will be possible to synthetically produce a soil that will grow blue hydrangeas.

Blue hydrangeas (*Rev. Hort.* [*Paris*], *75* (*1903*), *No. 5, pp. 114, 115*).—Observations are given which show that when débris from a slate roof was mixed with the soil, the color of the hydrangeas grown in such soil was blue. Where the broken slate was absent the color was red.

Nicotiana hybrids of the second generation, G. BELLAIR (*Rev. Hort.* [*Paris*], *75* (*1903*), *No. 3, pp. 54, 55, figs. 4*).—The author pollenized *Nicotiana sylvestris* by *N. tabacum* in 1901. The hybrids obtained were all similar in character. Seed obtained from these plants was planted in 1902. The resulting crop varied greatly resembling neither the original parents nor the hybrids of the first generation. Four distinctive types obtained are described. One type resembled *N. virginica*, two were profusely flowering sorts, and the fourth type was noticeable on account of the color and unusual proportions of the flowers.

Etherization and chloroforming of dormant plant parts, W. JOHANNSEN (*Norsk Havetidende, 18* (*1902*), *No. 12, pp. 194–203, figs. 5*).—The method of etherization and chloroforming of dormant plants worked out by the author for the purpose of shortening the resting period and thus accelerating the forcing of plants, flowers, bulbs, etc., is described in outline in the paper. The plants are placed in an air-tight etherization chamber lined with tin foil or with soldered sheet zinc; a layer of 2 to 3 cm. of dry sand is placed at the bottom of the chamber; when this has been carefully closed ether is poured in through a funnel at the top of the box and caught in a dish suspended directly under the same. The most convenient temperature for conducting the etherization is 17 to 19° C. The higher the temperature the more violent is the action of the ether. The ether vapor is generally left to act on the plants for 48 hours; toward the end of the rest period 24 to 30 hours will be found sufficient. As to quantities of ether required, 30 to 45 gm. of ordinary sulphuric ether per hectoliter (26.4 gal.) of air space is used in case of different plants, viz, lilacs, 32 to 40 gm.; Marie Legraye, not to exceed 38 gr.; Viburnum, 38 to 40 gm.; *Prunus triloba, Amygdalus persica,* Spiræa, etc., 30 to 35 gm.; *Azalea mollis* and other deciduous plants, 30 to 35 gm.; *Pyrus "floribunda"* forms, Staphylea, Deutzia, and Magnolia, 35 to 40 gm.; lily of the valley (before planting), 30 to 35 gm. After the etherization the plants are preferably forced at once; it is not necessary to use as high temperatures for etherized plants as is ordinarily the case. As the flowers of etherized plants are apt to be of a paler color than those appearing later in not etherized plants, it is advisable to place the plants, after the buds have opened, at a temperature of 12 to 15° C., where a deep color is a desideratum.

Chloroform may be used in the place of ether for shortening the resting period of plants, but it acts much more intensely and must be used in smaller quantities; three-tenths of the quantities recommended with ether will suffice. The highly inflammable character of both ether and chloroform renders extra care necessary in handling the liquids, especially where the etherization method is used under commercial conditions.—F. W. WOLL.

A woman's hardy garden, HELENA R. ELY (*New York: The Macmillan Co., 1903, pp. XVI+215, pls. 49, dgms. 4*).—This book presents in a popular manner methods of planting home grounds with hardy flowers and shrubs. Directions are given for laying out borders and planting with annuals, perennials, biennials, etc. A feature of the book is that in carrying out the work no greenhouse, hotbed, or cold frame is required.

How to make school gardens, H. D. HEMENWAY (*New York: Doubleday, Page & Co., 1903, pp. XVI+107, pls. 8, figs. 16*).—This is a popular work dealing with the details of making a school garden, such as laying out beds and planting seeds, sowing seeds in window boxes, making cuttings, grafting, and budding. A short bibliography of school-garden literature is appended.

The nature study idea, L. H. BAILEY (*New York: Doubleday, Page & Co., 1903, pp. 159, figs. 2*).—"An interpretation of the new school movement to put the child in sympathy with nature."

FORESTRY.

A German method of oak reproduction, W. F. HUBBARD (*Forestry and Irrig., 9 (1903), No. 4, pp. 199–202, pls. 3*).—A description is given of a method followed in Germany for the substitution of oak forests for beech. The demand for beech timber is a depreciating one, while that for oak is continually increasing and the method described was devised in the neighborhood of Karlsruhe. A portion of the beech forest is annually cut over and put in oak in the following manner: In the autumn before cutting and while the trees are still standing the ground is strewn with acorns which are superficially worked into the ground with picks or mattocks. After the acorns have been scattered and worked in the forest is cut clean, the lumbering operations serving to still further work the seed into the ground. The succeeding year the ground is heavily covered with a germination of oak and birch, the latter coming in of its own accord. The birch acts as an excellent nurse crop, since it grows faster than the oak and protects the oak seedlings from frost and sudden evaporation. By the time the seedlings are 6 years old they form a complete cover and very dense stand. At this time the poorly developed oaks are topped, the dead ones removed, and the birches cut away. The subsequent growth of the oak trees is looked after, and straight well-developed trunks secured by a continual pruning. At the age of about 50 years the whole area is to be underplanted with beech or spruce to protect the soil, and the oak allowed to develop as a high forest.

The cultivation of the locust tree, L. R. JONES and W. J. MORSE (*Vermont Sta. Rpt. 1902, pp. 239–243, fig. 1*).—The authors recommend for certain types of sterile soil in Vermont the cultivation of the locust tree (*Robinia pseudacacia*). In 1897, 100 seedling trees were set in rows 4 ft. apart each way. At 11 years old they averaged 16 ft. in height and 5 in. in diameter. Encouraged by this small planting 5,000 more seedling trees were planted in 1902 and 92 per cent of the trees were alive at the time of the report and making rapid growth. This planting was made at a total expense of from $27 to $32 per acre. Estimates are made of the possible value of the crop which it is believed at the twentieth year will be about $256 per acre. Suggestions are given for planting, and where there is danger from attacks of insects mixed plantations are recommended in which white and pitch pines, birch, elm and boxelder are believed valuable.

The black walnut, G. O. GREENE (*Industrialist, 29 (1903), No. 15, pp. 231–238*).—An account is given on the distribution and value of the black walnut, and notes are given on the rate of growth of a number of trees of known age which have been measured in different parts of Kansas. On account of the high price of walnut lumber the author argues that the planting of black walnut trees could be made a profitable investment.

Notes on Pseudotsuga glaucescens, G. BELLAIR (*Rev. Hort.* [*Paris*], *75 (1903), No. 9, pp. 208, 209, figs. 2*).—A description is given of *Pseudotsuga glaucescens* which is said to have been derived from the Douglas fir (*P. douglasii*) but is held to be sufficiently distinct to warrant its separation as a species.

A research on the eucalypts, R. T. BAKER and H. G. SMITH (*New South Wales, Dept. Pub. Instr., Technolog. Mus., Tech. Education Ser. No. 13, 1902, pp. XI+295, pls. 46, dgm. 1*).—The results of an extended study of the genus Eucalyptus are given in which the authors treat the systematic classification, hybridization, and evolution of species, together with their description, and the essential oils produced by them. The species described, of which there are more than 100, are grouped into 8 classes based according to the chemical constitution of the oils contained in their leaves. Special studies are reported on the different constituents of the oils, and the timber and forest characteristics of the different species are briefly mentioned.

A revision of the genus Eucalyptus, I, J. H. MAIDEN (*Sydney: Govt., 1903, pp. 48, pls. 4*).—The author has begun a critical revision of Eucalyptus, which is without doubt the most important genus of forest trees in Australia. The general habits of the trees are described and their value as timber as well as their economic production is shown. The characters which have been used at different times to aid in the classification of the species are mentioned, and a study reported of *Eucalyptus pilularis* and *E. pilularis muelleriana*. These species are technically described, and their characters as forest trees and the value of their timber shown.

Progress in national forestry, J. S. PEYTON (*Forestry and Irrig., 9 (1903), No. 4, pp. 194–197*).—A review is given of the forest reserves in the United States and their management.

Recent forest reserve consolidation (*Forestry and Irrig., 9 (1903), No. 2, p. 60*).—By Presidential proclamation the Teton, Yellowstone, and Absaroka forest reserves have been consolidated, the total area embraced by the present reserve being about 7,200,000 acres.

Forestry for southern New England wood lots, R. T. Fisher (*Forestry and Irrig., 9 (1903), No. 3, pp. 120, 121*).—When taken as a whole southern New England is said to be more or less covered with an immature growth of mixed hard woods. Few stands are to be found where the trees are more than 60 years old, and fully 75 per cent are of sprout origin. In many places comparatively worthless species of trees have taken possession of the ground to the exclusion of more valuable ones. In order to determine the proper management of these areas the Bureau of Forestry of this Department has caused surveys to be made of 25 tracts in southern New England, and a working scheme has been devised for each. The object in view was to bring the grown-over wood lands into a productive condition. In suggesting methods of treatment an essential consideration was to make the forest have a permanent value to its owner. What is chiefly required for success in these regions is a knowledge of the results to be desired and the ways of bringing them about. Extensive investigations have been carried on in this line which are to be published in a future bulletin of the Bureau of Forestry of this Department.

Forestry at an experiment station, W. Mulford (*Forestry Quart., 1 (1903), No. 3, pp. 81–86*).—A description is given of the forestry work which has been taken up and developed at the Connecticut State Station. This work was largely the result of legislation which directed the appointment of a State forester and placed in the control of the experiment station the purchase and planting of such lands in the State as are suitable for the production of oak, pine, or chestnut lumber. Under the call for offers of land at a price not exceeding $4 per acre, 24 tracts were offered aggregating about 7,000 acres. These have been examined and negotiations for their purchase are in progress.

The farm wood lot in Michigan, F. G. Miller (*Forestry and Irrig., 9 (1903), No. 4, pp. 187–189*).—Attention is called to the rapid deforestation of the northern parts of Michigan, and the value of the wood lot particularly in the southern portion of the State is indicated. In the southern part of the State the wooded area is rapidly decreasing, and with the increased value of forest products the author believes that under proper management the wood lot could be made a source of considerable revenue. The preservation and proper management of the natural wood lot as it now exists is said to be more important than artificial plantations, and for the management of such areas the author recommends the system adopted in the management of a successful wood lot in Pennsylvania. This consists of the removal of all dead, diseased, or otherwise undesirable trees, thinning as the trees become crowded, pruning and trimming to secure straight, clear stems, and the underplanting of all vacant and thin spots with some valuable tree, usually the white pine.

Minnesota's system of preventing forest fires, C. C. Andrews (*Forestry and Irrig., 9 (1903), No. 2, pp. 84, 85*).—The Minnesota system for preventing forest fires is now in operation over about 9,000,000 acres of forest lands, and the execution of the law is placed in the hands of the town supervisors who are made fire wardens. A chief fire warden is provided for by the law and it is made his duty to investigate the various aspects of forestry and report annually to the proper State authorities. The present appropriation for carrying out this law is $5,000, and a scale of compensation is given by which citizens who are called upon to help extinguish or control fires are remunerated. A considerable part of the expense of fighting fires is charged against the county, and the writer thinks that the law would be more effective if the State should pay two-thirds of the expense and the counties one-third.

The most profitable trees for planting on the waste lands of farms in New Jersey, F. R. Meier (*Proc. New Jersey State Hort. Soc., 28 (1903), pp. 208–215, pl. 1*).—According to the author, there is considerable land in New Jersey which is not adapted to general agriculture and it is thought possible that it may be made more productive by planting it with trees. Some of these areas are described, and the planting of willow, cottonwood, black locust, black walnut, tulip tree, yellow and white pines, and white cedar is recommended. Particular stress is paid to the planting of willows for osier purposes. The methods for preparing the ground are described, as well as the distance of planting, and subsequent cultivation and preparation for market. A report is given of a 15-acre osiery planted 8 years before at an expense of $73.60 per acre which yields annually a net profit of $85 per acre.

Forestry in Ohio, W. R. LAZENBY (*Forestry and Irrig., 9 (1903), No. 2, pp. 99, 100*).—According to the writer, less than 14 per cent of the area of Ohio is forested and the destruction of this small proportion is still going on. Attention is called to the desirability of retaining forests, and forest planting for timber, shelter, and ornamentation is recommended. The different kinds of lands and different methods of planting for these purposes are described. In order to foster scientific foresting the author recommends the exemption from taxation of a certain percentage of wood land on each farm, the appointment of a State commissioner of forestry, the establishment of a school of forestry in connection with the State university, the establishment of a State arboretum where every species of forest tree could be grown, and the securing by the State of large tracts of cheap lands to be managed as State reserves for permanent forests.

Conservative lumbering at Sewanee, Tennessee, J. FOLEY (*U. S. Dept. Agr., Bureau of Forestry Bul. 39, pp. 36, pls. 12*).—An account is given of the results of the management of the forest owned by the University of the South, at Sewanee, Tenn., the work being carried on under direction of the Bureau of Forestry of this Department. The forest in question had been badly used and was steadily declining in value. In 1900 the Bureau of Forestry undertook its management, the principal condition being that it should be done at no cost to the university. A plan of management was devised which has proved profitable and has left the forest in good condition after lumbering. When the cooperative plan was begun a conservative estimate of $3,000 was the value placed upon the timber. Under the plan of management a net profit in 1900-1 of $1,500 was secured, the following year about $1,200. It is said that 4 years more of lumbering remain to be done and for at least 3 years the annual profit should be about $1,500 a year, making the forest yield a profit of about $7,000 from timber formerly valued at $3,000. These profits were made possible through the careful planning of the lumbering in order to prevent waste and to secure the largest returns from the merchantable trees. In all the cuttings provision was made that the land should again produce valuable timber.

The report describes the forest in detail, enumerating the various species of trees, their characteristics and distribution, and gives recommendations for the future management of the tract. The recommendations can not be considered specific for the management of similar tracts in other regions of the South. The effects of fire, overgrazing, insect injuries, and improper cutting are described, and the methods of lumbering which were adopted are given at considerable length.

Evidence taken before departmental committee of the board of agriculture on British forestry (*London: Wyman & Sons, Ltd., 1903, pp. IV+241, dgms. 4*).—This consists of the evidence taken before a departmental committee appointed by the board of agriculture to inquire into and report upon the condition of British forestry. The general impression is given that the management of British forests is unskillful and that it could be readily improved. This condition is due to a great degree to the fact that the wood lands are not always planted or managed for revenue, but often as game preserves or for ornamental purposes. The forests of Scotland on the whole are said to appear better than those in England, but, according to the evidence, while the planting in Scotland is to be commended there is much subsequent mismanagement. Public forests are well managed on the whole, as is shown by reports of the condition of different crown lands.

The effect of deforestation on climate is mentioned and attention called to the fact that the forest area of Great Britain is considerably smaller than is believed to be the proper proportion for the best agricultural conditions. Considerable attention is paid to the subject of planting, in which it is shown that the cost of planting ranges from $7.20 to $20 per acre, as it appears from the returns from a number of large plantations. Among the species suggested for extensive planting the Scotch fir and larch are generally recommended, although the larch suffers considerably by disease. In addition to these trees a number of species of pines, as well as silver fir, cedar, and hard woods, are recommended.

In the appendices supplemental statements are made on a number of subjects, such as the relative merits of British and foreign timbers, the income from a mixed larch and fir wood at the end of its seventy-fifth year, receipts and expenditures from the clearance of an 18-acre mixed forest of about 75 years' growth, suggestions for the improvement of British forestry, outline of courses in forestry, description of various schools of forestry and their courses of instruction, timber tests of telegraph poles and cross arms, and area of crown forests in the United Kingdom.

Report of the forestry bureau July 1, 1901, to September 1, 1902, G. P. Ahern (*War Dept., Bureau of Insular Affairs, Philippine Com. Rpt. 1902, pt. 1, pp. 451–527, pls. 37, map 1*).—A detailed report is given of the progress made by the bureau of forestry during 1901–2. Numerous additions to the scientific staff are noted and also the organization of several new divisions and laboratories. The personnel of the scientific and administrative staffs is shown, the administrative staff consisting of 4 assistant inspectors, 10 assistant foresters, and 65 forest rangers.

Descriptions are given of the facilities provided for work in the different lines of investigation. Summaries are given showing the licenses granted between July 1, 1901, and August 31, 1902, for cutting timber, also the number of sawmills, employees, output, market value and income derived by the Government from all franchises for the utilization of forest products. The revenue derived during the time covered by the report was $348,073.08 Mexican, the Government charges being between 5 and 10 per cent of the market price of the timber in Manila. Valuation surveys have been begun and the results already obtained indicate a conservative estimate of an average stand of 3,500 cu. ft. of timber 20 in. in diameter, on over 20,000,000 acres of virgin forest. The total forest area of the archipelago is estimated at 48,112,920 acres, less than 1,000,000 of which is held by valid private title.

The forests are described and their principal species indicated, together with their groupings under the forest regulations adopted by the bureau. A preliminary working plan of Bataan Province, prepared by R. C. Bryant, is given in which the necessary operations for conservative lumbering are described. Investigations by P. L. Sherman on the forest products of the islands are also reported, particular attention having been given to the gutta-percha industry, the permanency of which is threatened by wasteful methods of exploitation.

Progress report of the forest surveys in Bengal, India, 1901–2, P. J. Gordon (*Calcutta: Supt. Govt. Printing, 1903, pp. 17, map 1*).—A progress report is given of forest surveys in India for 1901 and 1902 in which the character of the survey is indicated, and the extent of the surveyed and unsurveyed forest area is shown. The cost of the survey by provinces is given. The survey during the period covered by this report was quite extensive, and attention is called to the fact that it will be impossible to continue the work at the present rate without more adequate provisions for carrying on the work.

The production of timber in Algeria, J. Trabut (*Bul. Agr. Algérie et Tunisie, 9 (1903), Nos. 2, pp. 25–28; 3, pp. 55–59*).—A description is given of the forest conditions of Algeria, and attention called to the rapid disappearance of the Algerian forests wherever they occur in accessible regions. On account of the disappearance of trees of a size adapted to construction timber, the author suggests the artificial planting and describes a number of species which either have been tried or are believed to be adapted to Algerian conditions.

The forester and the lumberman, G. Pinchot (*Forestry and Irrig., 9 (1903), No. 4, pp. 176–178*).—An address, in which the author points out the necessity for cooperation between the lumber industry and the scientific forester, in order to secure the greatest measured benefits to both. A review is given of the methods of forestry and some of the results already obtained in this country. Attention is also called to the forestry operations conducted under governmental authority in the Philippines.

A profitable cutting of insect-killed timber, A. Cary (*Forestry and Irrig., 9 (1903), No. 3, pp. 149, 150*).—An account is given of a method of lumbering by which timber destroyed by bark beetles was profitably lumbered and at the same time the ravages of the bark beetles greatly reduced. The presence of the bark beetles in the spruce forests has been known for about 15 years, their ravages constantly increasing. In some tracts fully half the standing timber has been destroyed. The author arranged for the cutting of a considerable portion of dead timber, which belonged to the Berlin Mills Company, in such a way that the expense was not so great that contractors would be unwilling to undertake the lumbering. The ravages of the bark beetle appear to spread from centers, so that nearly all the trees in definite regions would be destroyed. By cutting these, together with enough green timber to justify the lumbering, it was found that contractors would undertake the necessary operations.

Preservation of soil fertility in plantations, A. C. Forbes (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 15 (1903), pp. 69–94*).—An argument in favor of more attention to the preservation of fertility in the soil of forest plantations.

Shade tree suggestions, A. Nelson (*Wyoming Sta. Bul. 57, pp. 14, pls. 5*).—This bulletin is prepared to show what may be done in improving the conditions of Wyoming in the way of street, lawn, and other plantings, the principal object being to give impetus to the movement for the ornamentation of homes, municipal buildings, parks, etc.

Creosoting timber, S. W. Labrot (*Tradesman, 49 (1903), No. 6, pp. 77, 78*).—A description is given of the processes of treating timber by the zinc-creosote method. This consists in two operations—the sterilizing and drying of the timber and the forcing into the wood of the antiseptic chemical. In sterilizing the timber great care must be taken to avoid overheating, as excessively high temperatures have a very damaging effect upon the strength of the timber. This is particularly true of those which contain resinous substances. These resins are evaporated at about 305° F. and their removal greatly weakens the structure of the wood. After sterilization the chemical is forced into the wood under pressure, and in the method described zinc chlorid is mentioned as the cheapest and most common substance used in this country. Timber treated in this manner is said to have its durability increased by 12 to 16 years in the case of white pine railroad ties, or from 18 to 30 years in railroad structural timbers.

SEEDS—WEEDS.

Timothy, alsike, and red clover seeds, G. H. Clark (*Canada Dept. Agr., Comr's Branch, Seed Division Bul. 8, n. ser., pp. 30*).—The purpose of this bulletin is to call attention to the trade conditions in timothy, alsike, and red clover seeds, and to give the results of analyses of more than 500 samples of seeds collected from various parts of Canada. A summary is given of the methods of seed testing and seed control that have been adopted in other countries, and other information which it is believed would be helpful to seed growers, merchants, and consumers. Inquiries were sent to a large number of correspondents from whom 513 samples were received and subjected to the usual seed analysis. Tables are given showing the market price of different lots of seed, the percentage of germination, number of weed seeds, and the actual cost of the living seed per bushel. A list is given of 25 of the principal weed seeds found in the different lots of seed and the proportion in which they occurred in the different samples.

Seed-testing stations in Hungary, J. SPEIR (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 15 (1903), pp. 53–62, fig. 1*).—An account is given of the organization of seed-test laboratories in Hungary, their equipment and methods are described, and results of tests shown. Tables are also given in which the rate of compensation demanded for making tests, together with the form of the report given for all seed testing, are shown.

Rules for seed examinations adopted by Danish seed control stations (*Tidsskr. Landbr. Planteavl, 8 (1902), pp. 223–233*).

Influence of the remedies employed in combating smut on the germination of seeds, B. MEZENTZOV (*Yuzh. Russ. Selsk. Khoz. Ghaz., 1902, No. 42; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 3 (1902), pt. 6, pp. 738, 739*).—The author presents results of experiments carried out on the Derebchinsk experiment field and at the Sobyeshinsk Experiment Station. Seeds were treated with copper sulphate solutions and were soaked with hot water. In one case the following results were obtained: (a) In dry earth there germinated: Nontreated seeds 80 per cent, soaked in copper sulphate solution 36 per cent, soaked in vitriol and washed with lime water 46 per cent, dipped in hot water 82 per cent. (b) In moist earth: Nontreated seeds 95 per cent, soaked in copper sulphate solution 75 per cent, soaked in copper sulphate solution and washed with limewater 85 per cent, steeped in hot water 96 per cent. Other series of experiments gave approximately the same results.—P. FIREMAN.

On the influence of salt water on the viability of seeds, O. ROSTRUP (*Tidsskr. Landbr. Planteavl, 8 (1902), pp. 37–40*).

On the viability of seed buried in the ground, O. ROSTRUP (*Tidsskr. Landbr. Planteavl, 8 (1902), pp. 35–37; 9 (1902), pp. 27–29*).

On the viability of weed seed, O. ROSTRUP (*Tidsskr. Landbr. Planteavl, 8 (1902), pp. 33–35*).—A cow was fed freshly cut weeds of different kinds and for 5 days the manure was examined for weed seeds. The viability of the weed seeds and other seeds found in 217 gms. of dung was subsequently determined. The total number of seeds and their viability are shown in the accompanying table:

Viability of weed seed from cow dung.

Name of seeds.	Total number of seeds.	Viability.	Name of seeds.	Total number of seeds.	Viability.
		Per cent.			*Per cent.*
Solanum nigrum	3,355	52	*Plantago major*	125	87
Chenopodium album	1,270	51	*Atriplex patula*	119	8
Stellaria media	377	49	*Veronica agrestis*	41	25
Sonchus asper	209	27	*Spergula arvensis*	44	9
Senecio vulgaris	191	5	*Polygonum aviculare*	31	35
Thlaspi bursa-pastoris	166	24	*Petroselium sativum*	21	86
Urtica urens	164	11			

A large number of other seeds were identified, but being found in only small numbers the results of the determinations of viability can not be considered of general value. In order to ascertain whether the length of time during which the seeds remain in the digestive tract influences the results of the viability determinations, the germination of seeds of *Solanum nigrum* on subsequent days was determined, with results as follows: First day after feeding, 48 per cent; second day, 53 per cent; third day, 55 per cent; fourth day, 52 per cent, and fifth day, 5 out of 7 seeds germinated. The percentage viability of seeds does not therefore appear to differ whether the seeds take 1 or 5 days to pass through the digestive tract of the cow.—F. W. WOLL.

Notes on weeds, W. CARRUTHERS (*Jour. Roy. Agr. Soc. England, 63* (*1902*), *pp. 279–288, figs. 8*).—Illustrated notes are given of a number of the more troublesome weeds to which the author has had his attention called by means of specimens received and inquiries regarding the habits and methods for eradication. A brief study is also reported on the British brome grasses and a key is added for the determination of the different species known to occur within the Kingdom.

Killing weeds in lawns, L. R. JONES and W. J. MORSE (*Vermont Sta. Rpt. 1902, pp. 243–248, figs. 2*).—Notes are given on the destruction of chickweed and crab grass in lawns. For the destruction of chickweed raking the lawns or sowing them with salt, or both methods combined, were found effective when made the last week of June. The application of 2 qt. of salt to the square rod, followed by thorough raking of the chickweed and a liberal sowing of grass seed, was completely successful in exterminating chickweed and in securing a full stand of grass. It is suggested that where salt is used on a lawn it should be done cautiously on a small scale, as the effects will vary in different soils and seasons. For the eradication of the crab grass the authors suggest care in selection of seed to avoid the introduction of this plant, which is an annual; the use of grass seed, fertilizer, and water freely so as to keep the grass in vigorous growth; and the hand weeding of the crab grass if it should appear.

DISEASES OF PLANTS.

Report of the vegetable pathologist, D. MCALPINE (*Jour. Dept. Agr. Victoria, 1* (*1902*), *No. 8, pp. 801–808, pls. 2*).—Among the subjects reported upon an account is given of experiments on the resistance of varieties of wheat to the rust, and the fact is brought out that so far as economic importance is concerned the only rust occurring in Victoria is that known as summer rust (*Puccinia graminis*). So far as it has been determined this rust, which is very abundant in Australia, produces uredospores—which would retain their vitality only during comparatively mild weather—and teleutospores, but the relationship between the teleutospores and the subsequent production of rust has not been determined. Notes are also given on the treatment of grain for the prevention of stinking smut, formalin, copper sulphate, and corrosive sublimate solutions being used. The different solutions were efficient in preventing the occurrence of stinking smut, but the most satisfactory treatment was that where the seed was soaked for 10 minutes in a solution of 1 lb. of formalin to 100 gal. of water. Notes are given on the black spot of apples and pears due to *Fusicladium* sp., as well as the bitter rot of apples.

Attention is called to experiments for the prevention of a fungus disease of grasses. This fungus (*Isaria graminiperda*) is figured and described, and it is shown that a liberal application of nitrogenous manures, sulphate of ammonia being the most satisfactoby, gave absolute exemption from attacks of the fungus. The application of the fertilizer not only prevented the occurrence of the disease but stimulated a greater production of forage.

The diseases of cultivated plants, G. DELACROIX (*Maladies des plantes cultivées. Paris: Min. Agr., 1902, pp. 73, figs. 81*).—Illustrated descriptive notes are given of a large number of diseases of cereals, potatoes, beets, forage plants, vegetables, orchard and vineyard fruits, etc., together with brief suggestions of the most approved methods of combating these troubles.

Notes on some important plant diseases of the Tropics, F. NOACK (*Ztschr. Pflanzenkrank., 12* (*1902*), *Nos. 4, pp. 227–234; 5, pp. 285–291*).—Brief critical notes are given on recent investigations in many tropical countries of some of the more important diseases of economic plants. Among those reviewed are the diseases and insects affecting coffee, cacao, tea, sugar cane, cotton, pineapples, bananas, citrus fruits, rubber trees, and cork oak.

Notes on some plant diseases, K. MALKOFF (*Ztschr. Pflanzenkrank., 12 (1902), No. 5, pp. 282–285, fig. 1*).—Brief notes are given on a number of diseases of plants which the author observed in the vicinity of Göttingen. The first described is the anthracnose of clover due to *Glœosporium caulivorum.* The author claims that red clover grown from seed from different countries seems to be unequally affected, that from eastern North America being most subject to disease, while the south Russian, Polish, and Canadian was least attacked. In addition to the red clover, the author reports the fungus as attacking *Trifolium purpureum* and *T. medium.* The early mowing of clover fields is recommended to prevent the spread of the disease. A second disease which also attacks clover is due to the fungus *Macrosporium sarcinæforme.* This fungus attacks the leaves, giving them a ragged appearance and later causing them to turn brown and fall from the plants. Inoculation experiments were carried on with cultures of this fungus which seem to demonstrate that it was due to this particular organism. The third disease described is that of leaf spot of rye, caused by the presence of *Rhynchosporium graminicola.* The extent of injury due to this cause was not determined.

The distribution of the anthracnose of red clover, G. LINHART (*Ztschr. Pflanzenkrank., 12 (1902), No. 5, pp. 281, 282*).—The distribution of *Glœosporium caulivorum*, the cause of clover anthracnose, or stem browning, as it is called, is said to cover practically all of Europe wherever red clover is grown. The author says that plants grown from American or European seed suffer alike and in some places as much as 50 per cent of the plants were observed to be dead as a result of the fungus. Weather conditions are said to exert an important influence on the occurrence of the diseases, unusual wet weather greatly favoring its spread. So far as the author's observations go, alfalfa does not appear to be subject to this disease. The fungus attacks all of the above-ground parts of the plant, the stems and petioles in particular, causing them to turn brown as though burned. There is thought to be some evidence of the transmission of the disease by means of infected seed, and it is recommended that seed be treated with a 1 per cent solution of Bordeaux mixture before sowing.

Investigations on cereal rusts, E. MARCHAL (*Bul. Agr.* [*Brussels*], *19 (1903), No. 1, pp. 114–153*).—After briefly reviewing the present status of the cereal rust problem the author gives descriptions of the more common species which he has investigated. Among those described are the black rust (*Puccinia graminis*), brown rust (*P. triticina*), yellow rust of wheat (*P. glumarum*), brown rust of rye (*P. dispersa*), pale rust of barley (*P. simplex*), and crown rust (*P. coronifera*). Most of these rusts have specialized forms which are also described. Analytical keys are given for the determination of the kind of rust found upon a plant, and a tabulated statement is presented showing the distribution and frequency of occurrence of the different species in Belgium.

The author states that wheat is most frequently attacked by the brown rust, followed by the yellow and black rusts in order of frequency. The figures upon which this conclusion is based are the averages of observations made during 2 seasons although slight differences are noted, particularly in the relative occurrence of the yellow and black rusts. Upon the rye the principal species is the brown rust, the black rust being rather rare and spasmodic in its appearance. The common barley rust is the pale rust which was found present in 92 per cent of all the specimens examined. The black rust is frequent in certain years, while the yellow rust which is so destructive in Sweden is unknown in Belgium. The oats suffer most from the crown rust, and the black rust is comparatively rare. The varying susceptibility of different varieties to disease is shown and the influence of soils, meteorological conditions, fertilizers, seeding, etc., on rust development are discussed. The rôle of barberry and boraginaceous and other plants on the alternate generations of the rust fungus is commented upon at considerable length. The losses due to cereal rusts are discussed and suggestions given for their prevention. Among the suggestions offered are the sowing of resistant varieties, early seeding, and rational fertilizing.

The treatment of stinking smut in wheat, J. REED (*Colorado Sta. Bul. 79, pp. 8*).—A description is given of the stinking smut of wheat caused by *Tilletia fœtens*, and 2 methods of treating the seed for smut prevention are described. In these treatments the seed was either soaked or sprinkled with solutions of copper sulphate, corrosive sublimate, potassium sulphid, and formalin. The results obtained showed the efficiency of copper sulphate, corrosive sublimate, and formalin, and demonstrated that potassium sulphid, besides being very expensive, is not an efficient remedy. Sprinkling the solutions over the grain and thoroughly mixing by raking or shoveling is recommended as the quickest and easiest, as well as most efficient treatment.

Potato diseases and their remedies, L. R. JONES and W. J. MORSE (*Vermont Sta. Rpt. 1902, pp. 209–230*).—A report is given of the potato diseases as they occurred in 1901 and 1902, the results of spraying experiments, the relation of date of digging to development of potato rot, the effect of top pruning potatoes, and potato scab experiments. During 1901 and 1902 there was an unusual prevalence of the late blight and rot due to *Phytophthora infestans*, and the conditions are believed favorable for the destructive occurrence of the disease in 1903 unless the summer should be an unusually dry one. In order to prevent serious losses from this cause the authors suggest the selection and saving of seed from the earlier planted crop on light soils so that there will be as little fungus as possible introduced to the seed potatoes, and the thorough spraying of the plants with Bordeaux mixture during the season.

The spraying experiments reported were begun in 1901, comparison being made between Bug Death and a Bordeaux-Paris-green mixture. The results are given at some length, from which it appears that although Bug Death was used in very large amounts its inefficiency as a fungicide was demonstrated. During the second year the spraying experiments were continued but Bordeaux mixture and Paris green alone were used. The results of these experiments are shown and a tabular statement is given showing the average gain for 12 years attributed to the use of Bordeaux mixture on late potatoes. The average increased yield attributed to this cause was 115 bu. per acre.

While carrying on the spraying experiments during the summer the soil of certain rows was sprayed to ascertain whether this treatment would prevent the development of the spores falling upon the soil and reaching the tubers. The results obtained are not considered conclusive, and although there was some evidence of eradication of disease this method of spraying is not recommended as practicable.

The question of how soon blighted potatoes should be dug has been frequently asked the authors, and a series of investigations was undertaken to ascertain the proper time of digging. The size of the plats and the extent of the experiment are considered too limited to admit of generalizations, but it appears that there was usually a greater loss from the earlier digging. So far as the investigations go, they seem to show that where there is danger of potato rot it is best to delay the digging for 10 days or more after the tops have died.

The effect of top pruning was studied on account of the unusual luxuriance of the potato tops, especially where they had been properly sprayed. The common belief was expressed that such a growth would interfere with the production of tubers, consequently the stalks of alternate rows were clipped back so as to present only about a foot of growth above the soil. The yield from the different rows at harvest is shown, from which it appears that practically $\frac{1}{3}$ of the crop was sacrificed by the cutting of the tops.

Potato scab experiments were carried on during the seasons covered by the report in which the susceptibility of different varieties was tested. In 1901 11 varieties were tested and in 1902 14 varieties. A comparison of the results shows considerable difference in the behavior of the different varieties, and the results are such as to lead to the hope that scab-resistant varieties may be secured by breeding and selection. Disinfection experiments in which formalin, corrosive sublimate, and formaldehyde vapor were tested for scab prevention were carried on and, as in all previous trials, both corrosive sublimate and formalin solutions proved equally efficient. The experiments with sulphur fumes and formalin vapor are to be continued.

Diseases of the potato in Ireland, T. JOHNSON (*Jour. Dept. Agr. and Tech. Instr. Ireland, 3 (1902), No. 1, pp. 8–21*).—Attention is called to a number of diseases of potatoes which occur more or less abundantly in parts of Ireland, at times causing serious losses. The potato blight (*Peronospora infestans*) and the sclerotium disease (*Sclerotinia sclerotiorum*), as well as the bacterial and Rhizoctonia diseases of potato are described, and an account given of the attack of *Phellomyces sclerotiophorus* upon the potato. So far as the author is aware this fungus has not previously been observed in Great Britain, and while truly parasitic may cause considerable unsuspected damage to the potato crop. It gives rise to a skin disease or scab of the potato tuber, followed by the rotting of the potato. In the earlier stage the presence of the fungus is indicated by the appearance of white shining patches on the skin of the tubers, and later the epidermal layers peel off leaving the underlying tissues exposed to the rot fungi. The disease may be carried over from one crop to another by planting with infected tubers and care should be taken to exclude them when observed.

Notes are given on a number of diseases of other plants, most of which are of common occurrence.

Some diseases of the potato and of fruit trees, A. LINTON (*Jour. Khedir. Agr. Soc. and School Agr., 4 (1902), No. 5, pp. 197–208, pls. 4*).—A description is given of a number of diseases of the potato and of various fruit trees that are caused by attacks of fungi, insects, or other animals. Among the diseases of the potato the most loss is occasioned by attacks of the early blight (*Macrosporium solani*). The early planting of potatoes, the use of less susceptible varieties, and spraying with Bordeaux mixture are recommended as preventive measures. The enemies of the fruit trees described are mostly insects, stem borers and scale insects predominating, with notes on peach-leaf curl, plum rust, grape downy mildew, etc.

A new fungus disease of potatoes, R. S. MACDOUGALL (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 15 (1903), pp. 312–319, figs. 4*).—A description is given of a disease of potatoes caused by the fungus *Chrysophlyctis endobiotica*. This disease has been previously described (E. S. R., 14, p. 979), and attributed to attacks of this fungus as well as to *Œdomyces leproides*. The life history of the fungus is described, and its occurrence on the potato crop is said to have first been noticed in 1899. In 1900 it was less abundant, but in the following years was quite prevalent. It is characterized by a peculiar warty outgrowth in the tubers, and commences about July or August, developing with the potatoes. Infection is usually through the eyes of the tubers, and may result in warty excrescences that are sometimes even larger than the potato itself. The disease is likely to manifest itself most seriously in damp places, although no perceptible deficiency has been noticed in the crop. After the potatoes are dug there appears to be no further development of the disease, nor do the affected potatoes seem more liable to decay. In planting the seed tubers should be carefully examined, and all affected ones rejected.

A bacterial disease of sugar beets, G. G. HEDGCOCK and H. METCALF (*Ztschr. Pflanzenkrank., 12 (1902), No. 6, pp. 321–324*).—A description is given of a disease of sugar beets which was recognized by the authors in various parts of Nebraska during the autumn of 1901 and later reported to them as occurring in Arizona and Colorado. As a result of the attacks of the bacteria the roots begin rotting at their tips and later the leaves and all the above-ground parts of the beets become entirely infested. The organism, which has been isolated and cultivated through various media, is described at some length. The bacterium seem to be somewhat similar to that described by Kramer as the cause of bacteriosis of beets, but differs in being anaerobic, growing upon gelatin and potatoes and developing a brown pigment with the evolution of gas on sugar-beet cylinders. The disease seems to be most prevalent in wet soils and it is possible that the draining of these soils would tend to the restriction of the organism.

Nematode diseases of bananas, sugar beets, etc., V. Mosseri (*La maladie vermiculaire. Cairo: Inst. Français, 1903, pp. 40, pls. 3, figs. 4*).—An account is given of nematode diseases of bananas, sugar beets, and a number of other economic plants which are caused by the presence of the nematode *Heterodera radicicola*. The effect of these parasites upon their host plants is described, and a complete description is given of the organism and its life history. Mention is made of 31 families of plants, embracing more than 100 species, which are known to the author to be subject to the attacks of this nematode. The effect of the disease on the composition of sugar beets is shown by analyses, and suggestions are given for combating the trouble. These consist in sterilizing the soil wherever possible, the rotation of crops, submersion of land from irrigation ditches, use of certain fertilizers, naturally resistant varieties, etc.

Nematodes in out-of-door plants, A. Osterwalder (*Ztschr. Pflanzenkrank., 12 (1902), No. 6, pp. 338–342, figs. 5*).—The occurrence of nematodes in the leaves, stems, and flowers of a number of wild plants is mentioned, and their effect upon the appearance of the plant is described. The species of nematode most commonly observed was *Tylenchus devastatrix*.

Anagallis arvensis as a host plant for stem nematodes, C. J. J. Van Hall and M. W. V. Van Bijlevelt (*Tijdschr. Plantenziekten, 8 (1902), pp. 144–149, pl. 1*).—The authors found that *Anagallis arvensis*, a common weed, especially on the light soils used for onion and hyacinth culture, was a favorite host plant for the nematode *Tylenchus devastatrix* that is so injurious to the onion and hyacinth culture. This fact is thought to account for the difficulty of ridding infected land of the nematode, even after years of cultivating with immune crops.—H. M. PIETERS.

Some diseases of sugar cane in the West Indies, A. Howard (*Ann. Bot., 17 (1903), No. 66, pp. 373–411, pl. 1*).—An account is given of the "rind" disease of sugar cane and also a root disease which is quite prevalent. The author claims that the Melanconium found on diseased sugar canes in the West Indies is not the cause of the rind disease, as has been claimed by other authors, but it is wholly saprophytic in its growth. The phases of *Trichosphæria sacchari*, which are claimed to be identical with those of *Thielaviopsis ethaceticus*, cause a disease of cane cuttings in the West Indies which is identical with the pineapple disease of cane cuttings in Java, and in addition the fungus is parasitic on the growing cane. The rind disease of the sugar cane in the West Indies is identical with that known as red smut in Java, and is caused by the fungus *Colletotrichum falcatum*. This fungus readily attacks ripening canes at wounds and at the old leaf bases, as well as the young canes which are capable of active growth. The Melanconium referred to above infects the canes at the points where they have been invaded by the Colletotrichum. The common root disease of sugar cane in Barbados is that caused by the fungus *Mirasmius sacchari*. Under certain conditions the mycelium of this fungus attacks the growing tissues of the roots, causing their destruction.

The gummosis of the sugar cane, R. G. Smith (*Proc. Linn. Soc. New South Wales, 27 (1902), pt. 1, pp. 31–47, pls. 2*).—A description is given of the disease of sugar cane caused by *Bacterium vascularum*. The substance of this paper has been previously noted (E. S. R., 14, p. 876).

An ascobacterium from the sugar cane, R. G. Smith (*Proc. Linn. Soc. New South Wales, 27 (1902), pt. 1, pp. 137–145, pl. 1*).—A description is given of *Bacterium sacchari*, n. sp., which has been noted elsewhere (E. S. R., 14, p. 876).

A gum-forming bacterium from Eucalyptus stuartiana, R. G. Smith (*Proc. Linn. Soc. New South Wales, 27 (1902), pt. 2, pp. 230–236, pl. 1*). A description is given of *Bacterium eucalypti*, n. sp., which is found in the saccharin exudate of *Eucalyptus stuartiana*. The occurrence of this organism has been previously mentioned (E. S. R., 14, p. 876).

The bacterial origin of gums of the arabin group, R. G. Smith (*Proc. Linn. Soc. New South Wales, 27 (1902), pt. 3, pp. 383–407*).—A study was made of various gums to determine the possibility of their bacterial origin. Fresh material was obtained from *Acacia penninervis*, and from the twigs of this tree small portions of gum were removed, the exterior portion sterilized, and cultures made from the fragments. In nearly every case 2 forms of bacteria were found present. The first, to which the name *Bacterium acaciæ* is given, the author believes is the cause of the production of the principal portion of the gum found on this plant. This organism in the laboratory was found to form a gum which behaved in all its reactions the same as the natural gum. The formation of gum on this tree is considered a bacterial disease, the bacteria elaborating the plant juices into gum which resembles the gum arabic in its properties.

The second organism, to which the name *B. metarabinum* is given, is believed to produce the more insoluble gums which occur associated with the others. In conclusion the author states that gums of the arabin group occur not only in the Acacias, but among other plants, particularly certain Rosaceæ, and he believes it probable that they are produced by the work of similar organisms to those described above.

Cucumber diseases, G. E. Stone (*Massachusetts Sta. Bul. 87, pp. 29–42, figs. 8*).—Descriptions are given of a number of cucumber diseases, particular attention being paid to those occurring on cucumbers grown under glass. Among those described are a leaf curl, in which the leaves assume a spherical form due to the inrolling of the wilted edges of the leaves; a stem curl, which is said to be a more pronounced form of the same disease; and a cucumber wilt, all of which are attributed to improper conditions of cultivation. Among the diseases caused by fungi are the anthracnose, downy mildew, timber rot, damping off, powdery mildew, nematode diseases, etc. These different diseases are described and preventive means suggested where such are known. The author recommends the fumigation of the houses before planting with sulphur or potassium cyanid. The sulphur treatment is less expensive, but for most purposes the cyanid is to be preferred. Either of the treatments will remove some of the more common pests of greenhouses, and it is believed that growers will find the practice of fumigation highly advantageous.

Orchard diseases and their remedies, L. R. Jones and W. J. Morse (*Vermont Sta. Rpt. 1902, pp. 230–239*).—A description is given of the destructive presence of the apple scab fungus during the summer of 1902. Owing to the excessive amount of rainfall spraying was much interfered with, and in many cases where applications of Bordeaux mixture and Paris green were made early in June a rusting or russeting of the fruit was reported and in a few cases there was a decided spotting of the foliage. Similar troubles were reported during the season from a number of localities, and after a careful examination the authors reached the conclusion that the trouble is due primarily to weather conditions and is aggravated by the spraying. An inspection of the orchards of Grand Isle gave abundant evidence of gain from spraying, and while there was a serious amount of damage due to the russeting the quality of the well-sprayed fruit was much higher than that from the unsprayed. The experience derived during the season suggests that the strength of solutions should be varied to suit the period of growth, climatic conditions, and fineness of the spray. The coarser the spray the weaker should be the solutions, and in early spring stronger mixtures may be used than during the summer.

Studies are reported upon plum blight which have already been noted (E. S. R., 14, p. 880).

A destructive apple rot following scab, H. J. Eustace (*New York State Sta. Bul. 227, pp. 367–389, pls. 9*).—During the autumn of 1902 in western New York there appeared a white, mildew-like fungus upon apples which was associated with the scab which had been unusually prevalent during the season. There was no relation between the 2 fungi except that the apple scab, by breaking the epidermis, made it possible for the second fungus to infest the fruit. An examination showed that this new disease was caused by the fungus *Cephalothecium roseum*, a fungus which had hitherto been regarded as a saprophyte. A description is given of the organism and the effect which it produces, as well as statements regarding the susceptibility of various varieties to the disease. Rhode Island Greening, Fall Pippin, and Fameuse seemed more affected than any other varieties, the Rhode Island Greening suffering by far the most.

While the author's investigations were confined to western New York, replies which were received from a number of other localities indicate that the same trouble existed in Michigan, Ohio, and Nebraska. The fungus, which grows commonly as a saprophyte, was studied and attempts made to discover its means of being carried over from season to season. So far the author has been unable to find the organism on any portion of the apple tree except its fruit, but it has been reported as occurring on maple trees in a way that suggests it may possibly be parasitic. This point will be determined by subsequent investigations. The fungus has been found saprophytic on the black knots of cherry and plum trees, as well as on firewood, and also on the fruiting pedicels of grapes.

Inoculation experiments are reported in which the rot was easily produced, and preventive measures are suggested. Spraying the trees for the prevention of scab would greatly reduce the liability of attacks of rot, and the apples when gathered should be carefully assorted and placed in cold storage where a dry, low temperature would restrict the further development of the fungus. The effect of dipping apples in solutions of copper sulphate and of formalin was tested in which different strengths of solutions were used, and both the fungicides materially checked the growth of the fungus. A soft rot caused by *Penicillium glaucum* made its appearance upon the treated apples, being more abundant upon those than upon the check.

Apple troubles in 1902, F. H. Hall, F. C. Stewart, and H. J. Eustace (*New York State Sta. Buls. 220 and 227, popular ed., pp. 8, pls. 4*).—This is a popular edition of previous publications (see above and E. S. R., 14, p. 774).

Botanical investigations on fruit diseases (*Illinois Sta. Circ. 67, pp. 15–19, fig. 1*).—The botanical investigations reported were mostly made upon the bitter-rot fungus, preliminary accounts of which have already been given (E. S. R., 14, pp. 367, 581). Some other diseases were studied, among them the black rot, brown rot, apple canker, etc. Investigations were also conducted on the effect of spraying fruit trees while in bloom, the results obtained showing that spraying during the blossoming period prevents the setting of fruit in the case of those blossoms which have but recently opened. The fungicide seems to kill the stigmas and prevents the germination of the pollen.

Spraying for bitter rot (*Illinois Sta. Circ. 67, pp. 10–15*).—A brief report is given of the spraying which has been carried on by the station during 1901 and 1902 for the control of the bitter rot of apples. In 1902 the value of different times and numbers of applications was investigated, the work being carried on in 3 different orchards. The fungicide used was Bordeaux mixture composed of 4 lbs. of lime, 4 lbs. of copper sulphate, and 50 gals. of water.

In one orchard the trees sprayed were Ben Davis and Huntsman, the latter being extremely susceptible to bitter rot. A tabular statement shows that the Ben Davis trees sprayed 5 times before the appearance of the rot and once afterwards contained 3.93 per cent infected fruit, while those sprayed once shortly before the appearance of the disease and twice afterwards gave 16.84 per cent of fruit which was infected with bitter rot, and the check trees which were not sprayed gave 44.94 per cent. The variety Huntsman, which is particularly susceptible to disease, was given a somewhat similar treatment. Trees sprayed 4 times before the appearance of the rot and twice afterwards yielded a crop 54.76 per cent of which was infected with the bitter rot. Trees sprayed twice after the rot appeared had 83.54 per cent of their fruit affected, while those not sprayed were attacked to the extent of 89.27 per cent.

In the other orchards the effect of treatment after the appearance of the disease was investigated. In one the trees of the Ben Davis variety sprayed 5 times after the disease had become fully established gave a crop 48.26 per cent of which was affected. Those which were sprayed 3 times after the disease was established were affected to the extent of 59.96 per cent, and the check trees 68.53 per cent. In the third orchard where Willow Twig trees were sprayed the percentage of infection was 57.82 per cent on trees sprayed 5 times after the disease appeared, 62.34 per cent on those sprayed 3 times after the appearance of the disease, and 63.81 per cent upon the nonsprayed trees.

From these experiments the conclusion is drawn that it is possible by the use of Bordeaux mixture to reduce the amount of bitter rot to less than 4 per cent in orchards where nearly 45 per cent of the fruit of unsprayed trees were affected. Applications should be made before the first appearance of the disease to be of the greatest value, although those made after the bitter rot had become established were not without some effect. The fruit should be well covered with the Bordeaux mixture and this can only be secured by several successive applications of the fungicide. The investigations for spraying are to be continued during the present year.

Apple canker, F. C. SEARS (*Nova Scotia School Hort. Rpt. 1901–2, pp. 17–20, figs. 2*).—A description is given of apple-tree canker, and results of treatment for its prevention are shown. Based upon his investigations the author recommends the cutting out of the cankers and painting over the exposed surface with copper sulphate followed by some heavy paint.

Report of the laboratory of vegetable physiology and fermentations, H. MÜLLER-THURGAU (*Jahresber. Vers. Stat. u. Schule, Wädensweil, 1899–1902, pp. 66–94*).—A report is given of investigations on frost injuries to fruit trees and grapes, the Monilia disease of stone fruit trees in which the twigs suffered severe injury, the browning or scorching of grape stock due to attacks of *Pseudopeziza tracheiphila*, testing wine ferments, on the fermentation of tannin-free pear must, and on the affections to which various wines are subject. Two papers by A. Osterwalder on the morphology of some species of Saccharomyces used in fermenting fruit wines and the formation of sulphureted hydrogen in fruit and grape wines are added.

Two diseases of vanilla, G. DELACROIX (*Reprint from Bul. Soc. Mycol. France, 18 (1902), No. 3, pp. 14, figs. 2*).—A description is given of 2 fungus diseases of vanilla, the first of which has previously been attributed to *Calospora vanillæ* and the second to *Uromyces joffrini*. According to the author, the fungus causing the first disease is a form of *Glœosporium* or *Colletotrichum vanillæ*. It causes considerable injury to the vanilla plants, and for its prevention spraying with Bordeaux mixture or similar fungicide is recommended, care being taken to prevent the fungicide from coming in contact with the fruits. The second disease described produces a rust of vanilla and so far has not proved of any particular injury.

At the conclusion of this paper the author describes the development of *Glœosporium musarum*, a fungus which causes a blackening of the banana fruit.

The gooseberry mildew in Europe, E. S. SALMON (*Jour. Roy. Hort. Soc.* [*London*], *27* (*1902*), *pt. 2–3, pp. 596–601, fig. 1*).—A review is given of the occurrence and and distribution of the gooseberry mildew *Sphærotheca mors-uvæ*. This disease seems to be widely spread throughout northern Europe and there is apparently evidence to show that the fungus is endemic in Russia and possibly elsewhere. Since the first report of the outbreak of this disease it has appeared in widely separated districts and in every case assumed a serious character. A thorough spraying of the affected plants with potassium sulphid or Bordeaux mixture is recommended as a preventive treatment.

The distribution of the gooseberry mildew in Russia, P. Hennings (*Ztschr. Pflanzenkrank., 12 (1902), No. 5, pp. 278, 279*).—The presence of the gooseberry mildew (*Sphærotheca mors-uvæ*) in various parts of Russia is mentioned, and a number of new stations are added.

Chemical and physiological studies on the mulberry dwarf disease, U. Suzuki (*Ztschr. Pflanzenkrank., 12 (1902), Nos. 4, pp. 203–226; 5, pp. 258–278, pls. 2*).—This is essentially the same article as that previously noted from the bulletin of the College of Agriculture of the University of Tokyo (E. S. R., 13, pp. 61, 866).

Diseases of trees and plants, W. Carruthers (*Jour. Roy. Agr. Soc. England, 63 (1902), pp. 288–295, figs. 2*).—Notes are given on the Monilia disease of plums, the apple scab, the cherry fungus (*Gnomonia erythrostoma*), clover disease caused by *Sclerotinia trifoliorum*, black mold of currants (*Capnodium salicinum*), and Rhizoctonia disease of mangel-wurzels. Attention is called to the diseased condition of potato tubers which is due to attacks of *Chrysophlyctis endobiotica.* Attention is also called to a previous publication in which it was claimed that this disease was due to *Œdomyces leproides.* The two fungi are said to be identical and the previous name is the proper one to be used.

Æcidium elatinum as the cause of witches' brooms of the silver fir, E. Fischer (*Ztschr. Pflanzenkrank., 12 (1902), No. 4, pp. 193–202, pls. 2*).—In continuation of his previous investigations (E. S. R., 14, p. 162) the author reports additional notes on *Æcidium elatinum* as the cause of the witches' broom of the silver fir. Numerous inoculation experiments are reported upon in which the æcidio, uredo, and teleuto forms of the fungus were employed and the definite cause of the disease determined. The alternate generations of the fungus and their host plants are described.

The perithecial forms of Phleospora ulmi and Glœosporium nervisequum, H. Klebakn (*Ztschr. Pflanzenkrank., 12 (1902), No. 5, pp. 257, 258*).—It is claimed that the perithecial form of *Phleospora ulmi*, a common fungus on elm leaves, occurs on the leaves that winter over attached to the tree or sometimes detached, and this form has been described as *Mycosphærella ulmi.* The perithecial form of *Glœosporium nervisequum*, the cause of the leaf blight of sycamores and other trees, is said to be *Læstadia veneta.*

A disease of lilacs caused by Botrytis vulgaris, C. J. J. Van Hall (*Tijdschr. Plantenziekten, 8 (1902), pp. 142, 143, pl. 1*).—The author observed that the variety of lilac known as Madame Lemoine was affected by a disease caused by *Botrytis vulgaris.* No other variety of lilac was found similarly affected, although several nurseries were examined. The disease begins at the apex of the leaf and works back, drying up the leaf as it progresses. The dead portion of the leaf is marked with a series of rings, showing that the disease proceeds irregularly rather than steadily. The reason for the special susceptibility of this variety is thought to be its sensitiveness to wet weather, of which there had been a great deal during the season, and that therefore the plants were not in condition to resist the attacks of the parasite.—H. M. PIETERS.

Some pests of the flower garden, M. C. Cooke (*Jour. Roy. Hort. Soc. [London], 27 (1902), pt. 2–3, pp. 369–406, pls. 3, figs. 55*).—Descriptive notes, together with suggestions for prevention, are given of a large number of diseases of many of the common plants in the flower garden. The diseases are popularly described, the distribution of the fungus indicated, and sufficient technical descriptions given for the specific identification of the different species of fungi.

A disease of the carnation, M. C. Potter (*Jour. Roy. Hort. Soc. [London], 27 (1902), pt. 2–3, pp. 428–430, figs. 3*).—A description is given of the leaf spot of carnations caused by *Septoria dianthi.* This disease has been under observation for about 4 years, and the presence of the fungus in Great Britain has not hitherto been recorded. The fungus is described and the results of successful inoculation experiments are reported.

The treatment of fungus pests, A. HOWARD (*Imp. Dept. Agr. West Indies, Pamphlet No. 17, 1902, pp. 43, figs. 5*).—Brief popular descriptions are given of a number of the more common plant diseases known to occur within the West Indies, and suggestions made on measures to be adopted to prevent their spread.

Annual review of the literature relating to plant diseases, 1901, M. HOLLRUNG (*Jahresbericht über die Neuerungen und Leistungen auf dem Gebiete der Pflanzenkrankheiten. Berlin, 1903, pp. VIII + 305*).—A review is given showing the progress that has been made in protecting useful plants against fungus, insect, and other depredations, and means for preventing loss from these agencies. The literature, which is quite voluminous, is for the most part grouped as in the previous reports (E. S. R., 12, p. 658; 14, p. 62), the classification being essentially the same. In the present number the author gives a short summary of the present status of knowledge regarding the various topics discussed, followed by abstracts of the more important contributions relating to them and a list of related papers, some of which are briefly abstracted. The new grouping of all the references to a single topic will be found a decided advance over the former arrangement, in which the important abstracts were separated from the briefer ones and those which were only mentioned by title.

ENTOMOLOGY.

Proceedings of the fifteenth annual meeting of the Association of Economic Entomologists (*U. S. Dept. Agr., Division of Entomology Bul. 40, n. ser., pp. 124, pls. 2, figs. 6*).—An account of this meeting, held in Washington, D. C., December 26 and 27, 1902, has been previously given (E. S. R., 14, pp. 535–538). In addition to the papers there noted, the following are included in the proceedings:

The lime-sulphur-salt mixture in Connecticut, W. E. Britton (p. 38).—This mixture proved to be as effective as any other remedy in the destruction of scale insects and did not injure trees in any case. It was also used in several large orchards with satisfactory results.

Development and hibernation of mosquitoes, H. A. Morgan and J. W. Dupree (pp. 88–92).—From these studies it is concluded that the 24 species of mosquitoes upon which notes were made can breed successfully in small pools. Most of the mosquitoes deposit their eggs singly upon the surface of the water. Water is believed not to be essential to the pupæ of some species so long as moist soil is accessible. The only 2 stages in which the mosquitoes were found hibernating were the egg and adult conditions.

Some insect inhabitants of the stems of Elymus canadensis, F. M. Webster (pp. 92, 93).—This species was much more extensively infested by insects, especially those of the genus Isosoma, than other related species of the same genus.

Some insect notes of the year, F. M. Webster (pp. 93–96).—A brief discussion of the Hessian fly, apple aphis, *Schizocerus zabriskei*, *Ceratomia catalpæ*, etc. It was observed that the red rust was more prevalent on wheat which had been attacked by the Hessian fly than on that which was not thus affected.

Mosquitocides, J. B. Smith (pp. 96–108).—Experiments were made to determine whether any insecticide substances could be mixed with water so as to prevent the development of mosquitoes. In these experiments the author tested permanganate of potash, Mosquitocide, salt, naphthaline, lime, copperas, crude petroleum, Phinotas oil, Phinotas disinfectant (5 per cent and 20 per cent), Phinotas Mark G, soluble blast furnace oil, Chloro-naphthalum, Puraline, Tarola, Milky Disinfectant, cretol, soluble creosote, Cresol (100 per cent), Phenol-septol, Synol Liquid, etc. These experiments indicate that there are several preparations which may serve as disinfectants and larvicides, even when highly diluted. Good results were obtained from the use of Puraline and Phinotas oil.

Vernacular names of insects, E. W. Doran (pp. 108–111).—The author compiled a list of 3,500 compound vernacular names of insects and suggests certain rules to be observed in writing these compound words.

Notes on the larger sugar-beet leaf beetle, F. H. Chittenden (pp. 111–113).—*Monoxia puncticollis* was very injurious to sugar beets at Rocky Ford, Colo. Notes are given on the appearance, habits, and life history of this insect. For controlling the beetle the author recommends spraying with Paris green or arsenate of lead.

Some insects recently injurious to truck crops, F. H. Chittenden (pp. 113–120).—Biological and economic notes on the fall army worm, white grubs, leaf-footed plant bug, various species of blister beetle, *Scapteriscus didactylus*, *S. abbreviatus*, *Nysius minutus*, *Corizus hyalinus*, strawberry weevil, mealy bug on peanuts, *Elasmopalpus lignosellus*, etc.

Report of the entomologist, C. P. GILLETTE (*Colorado Sta. Rpt. 1902, pp. 103–126, pls. 6*).—During the season considerable loss was suffered from the attacks of grasshoppers, especially *Melanoplus differentialis*, *M. bivittatus*, and *M. femur-rubrum*. The author recommends plowing to destroy the eggs or the use of poisoned bran or hopper-dozers. About 400 tubes containing cultures of South African grasshopper fungus were distributed in various parts of the State and a few of the persons who used this fungus reported good results while a large number had no results. Experiments at the station with this fungus were an utter failure. No evidence was obtained to show that a single grasshopper had been killed by the fungus. In a few cases an investigation was made of localities where success had been reported and it was found that the grasshoppers were dying from another fungus (*Empusa grilli*).

Aspidiotus howardi is reported as injurious to pear and white-ash trees. Plant lice were unusually abundant, especially *Aphis pomi* and *A. viburni*. Sugar-beet leaf beetle (*Monoxia puncticollis*) destroyed about half of a 14-acre field of beets near Rocky Ford and also caused injury to beets at Ft. Collins. The beetles were found throughout the summer and the insect is double brooded. Paris green, London purple, and Paragrene gave good results when mixed with flour at the rate of 1:20. The native food of the insect consists of a number of plants which grow in alkali regions. The cherry slug was unusually abundant in the northern part of the State. Good results were obtained in combating this insect by spraying with Paris green, London purple, or Paragrene at the rate of 1 lb. to 160 gal. water, arsenate of lead at the rate of 1 lb. to 25 gal. water, white hellebore, 1 oz. to 3 gal. water, or by the use of pyrethrum or lime. Zenoleum used at the rate of 1 lb. to 50 gal. water killed the insects but injured the plants somewhat. Road dust was of little value.

Notes are given on the Western strawberry sawfly by S. A. Johnson. The species is described as new by A. D. MacGillivray, under the name *Emphytus gillettei*. The adult insect appears in May and early June and lays its eggs in the leaves. The larvæ hatch in a few days and live for a week or longer on the lower epidermis of the leaf. At the end of 4 to 6 weeks they become full grown and crawl into the ground to pupate. There is 1 brood annually. White hellebore is recommended as a remedy.

Tychea brevicornis is reported as injuring beets. In preventing the attacks of this insect the author recommends that the beets should not be planted in ground that was previously occupied with corn or salt grass. Considerable injury is reported as having been suffered by pine trees in Platte Canyon. *Pinus ponderosa* was attacked by a number of bark beetles, including *Tomicus calligraphus*, *T. integer*, *T. oregoni*, *Dendroctonus ponderosa*, *D. valens*, etc. The author recommends cutting and burning dead trees and the cutting for timber or fuel of such trees as show signs of weakening.

A list of bee plants is given showing the more important flowering plants from which bees gather honey in Colorado. Records kept showing the dates at which colonies of bees make their first gain in weight indicate that these dates correspond with the dates at which alfalfa begins to bloom. The dates varied from June 8 to 25.

Report of the State entomologist, A. L. Quaintance (*Rpt. Maryland State Hort. Soc., 5 (1902), pp. 22–27, fig. 1*).—The author discusses the extent of orchard-inspection work done during the year and describes the method of procedure adopted in the case of infestation by San José scale. This insect was found in 1,280 localities in the State. The most satisfactory results in combating the San José scale were obtained from the use of lime-sulphur-salt wash applied just before the buds begun to swell in the spring. For summer treatment the author recommends kerosene emulsion.

Principal injurious insects of the year, A. L. Quaintance and R. I. Smith (*Rpt. Maryland State Hort. Soc., 5 (1902), pp. 99–110, figs. 11*).—Biological and economic notes on the strawberry weevil, flea beetles, imbricated snout beetle, onion maggot, squash ladybird, pear-tree slug, rose chafer, *Melanoplus bivittatus*, pea louse, and black peach aphis.

Report of the entomologist, C. French (*Jour. Dept. Agr. Victoria, 1 (1902), No. 8, pp. 793–800, pl. 1*).—Brief notes on the correspondence, publications, investigations, and experiments of the entomologist for the past season. Many additions have been made to the Museum of Economic Entomology and Ornithology and to the library. Notes are also given on the inspection of orchards, nurseries, and fruits, and a list is presented of the insects and fungi which are considered as dangerous under the Vegetation Diseases Act.

Annual report for 1902 of the zoologist, C. Warburton (*Jour. Roy. Agr. Soc. England, 63 (1902), pp. 296–307, figs. 2*).—The author discusses maggots in sheep, root-knot eelworm, oak tortrix, and black-currant gall mite. In preventing the attacks of the sheep botfly the author recommends the application to the sheep of some malodorous preparation, such as tar water. In the destruction of the root-knot eelworm considerable success was obtained from the use of carbolic acid applied at the rate of 33 oz. to 15 cu. ft. of soil. The use of remedies in the destruction of the black-currant gall mite was not attended with promising success. The author urges the desirability of securing uninfested plants at the start. Brief notes are also given on wireworms, *Eriophyes avellanæ*, and *Oribata orbicularis*.

Orchard and bush fruit pests and how to combat them, C. Warburton (*Jour. Roy. Agr. Soc. England, 63 (1902), pp. 115–134, figs. 12*).—Formulæ are given for the preparation of Paris green, arsenate of lead, kerosene emulsion, and quassia mixtures. Among the injurious insects noted by the author special mention is made of winter moth, cherry sawfly, red spider, apple-blossom weevil, codling moth, apple sawfly, pear midge, woolly aphis, oyster-shell bark louse, leopard moth, currant sawfly, currant borer, currant gall mite, raspberry beetle, etc. Notes are given on the habits, life history, and approved methods of combating these species of injurious insects.

Entomology, M. V. Slingerland (*Proc. West. New York Hort. Soc. 1902, pp. 46–50, figs. 3*).—Notes on the palmer worm, cankerworm, Hessian fly, striped cucumber beetle, cherry fruit fly, and fall webworm. The author discusses the value of lantern traps. It is believed that injurious insects may be combated much more cheaply and effectively by other means than by lantern traps.

Insects injurious to fruit trees, H. Faes (*Chron. Agr. Canton Vaud, 15 (1902), No. 18, pp. 521–532, figs. 5*).—Notes are given on the habits, life history, and means of combating codling moth, *Balaninus nucum*, *Cheimatobia brumata*, and other less important species injurious to fruit trees.

Observations and experiments in combating animal pests on fruit trees, grapevines, and garden vegetables, Hofer (*Jahresber. Vers. Stat. u. Schule, Wädensweil, 1899–1902, pp. 108–121*).—The author discusses the injurious habits of

Diplosis pyrivora, *Cephus compressus*, *Lecanium vini*, and a number of species of gall mites. Experiments with mixtures containing soft soap showed that a 4 per cent solution was sufficient to kill the young lecanium. For destroying plant lice the author used a mixture containing soft soap, hard soap, and coal tar; also Nicotianin and mixtures containing soft soap and insect powder, and soft soap and quassia. A dilute tobacco decoction was also tested. All of these remedies proved very efficient in destroying the insects on the various fruit trees. In combating cabbage butterflies the author dusted flowers of sulphur, lime, and pulverized naphthaline on infested plants. Fluid sprays were used containing quassia, benzine, petroleum, tobacco extract, and a number of proprietary remedies. The dry insecticides had little effect, while quassia, benzine, and petroleum gave excellent results.

San José scale investigations, IV, V. H. Lowe and P. J. Parrott (*New York State Sta. Bul. 228, pp. 389–446, pls. 7*).—The experiments reported in this bulletin were carried on in several localities in the State. No count of scales was made, since this method was considered inadequate as a check upon results. In laboratory experiments with infested apples, however, the scales were counted. As a rule the trees were sprayed once and then such portions as had been missed were later covered with the spray. A number of nozzles were used, the Seneca and Vermorel proving most satisfactory. An orchard of peach and plum trees on Long Island was sprayed March 25–29, the amount of mixture used averaging about $1\frac{1}{8}$ gal. per tree. The weather following the application was rather wet. The buds of the peach trees were delayed about a week in opening, but at the time of the final examination these trees were in better condition than the control trees. A slight injury appeared in the fruit buds of the plum trees, but this was not permanent. The scales were nearly all destroyed. The wet weather had little effect on the spray, the mixture remaining upon the tree until May.

Another orchard of plum and peach trees in Columbia County was treated March 31–April 1, with the same general results. There were severe rains for 30 days after the application, but the killing effects of the wash were apparently not diminished. An orchard of pear trees in Columbia County was sprayed April 1 and 2, the weather conditions being the same as those just mentioned. The results were likewise satisfactory, the scales being nearly all destroyed and the wash remaining on the tree for about 2 months. Similar results were obtained from the treatment of another pear orchard in Columbia County with but 1 application and no respraying. An apple orchard in Ontario County was sprayed April 23–26, when many of the buds had already opened. Rainy weather followed for a period of 30 days. The foliage appeared to be considerably injured, but the trees recovered from the burning. The average yield of apples in this orchard had been 80 bu., while after treatment the yield was 275 bu. The same satisfactory results were obtained from the treatment of apple trees in the station orchard. An orchard of pear and peach trees in Niagara County was treated April 7–16. Frequent heavy showers occurred during April and May. The leaf buds were somewhat burned, but no permanent injury was caused. The spray remained on the trees 2 months and the results were highly satisfactory. In these experiments 710 trees were treated, with uniformly good results in the destruction of the scales without serious injury to the trees and with evidence that rainy weather does not diminish the effectiveness of the wash.

In the laboratory experiments the principal object was to determine whether the insecticidal property of the wash is due to the soluble ingredients or precipitates in the wash. The mixture was sprayed on a glass plate, and after being allowed to dry was subjected to a water spray from an atomizer. The solution thus obtained was applied to infested apples. A large percentage of the insects were killed by this solution. Solutions obtained within 72 hours after the application of the wash to the plate were more efficient than those obtained later. An experiment to determine the length of time during which the wash retains its insecticidal properties showed that the solution obtained from the first application to the dried wash killed all the scales, while that obtained 6 days later killed only 10 to 13 per cent.

In testing the effect of an excessive amount of precipitates upon the scale the author found that the precipitates exercised a pronounced mechanical effect, while soluble ingredients killed the scales immediately. The authors found by experiments that the solution due to a falling of rain upon the wash upon the trees destroyed scales which had not been touched by the first application. The effect of the precipitates in the wash without the soluble ingredients was most marked on the young scales, while the adults were but little affected. In these experiments 50 apples were used, the number of scales varying from 1 adult and 11 young to 63 adults and 1,250 young on each apple. In the test of lime-sulphur compounds as a summer treatment, peach and pear trees were sprayed on June 14. The leaves were nearly all killed, but new leaves formed and a good crop was produced. The scales were all destroyed. Similar results were obtained in experiments with plum trees. It was found possible to produce a lime-sulphur wash without boiling, by slaking lime, adding sulphur in the form of a dust to the lime while slaking, and then adding caustic soda to the mixture. This insecticide promises to prove satisfactory.

The authors experimented with a number of other washes, including resin wash according to the California formula and the station formula, lime-water-kerosene wash, ammonia-casein wash, lime-sulphur-salt wash and casein, lime-sulphur-salt wash using the liquid only, lime-sulphur-salt wash and Bordeaux mixture, and potash-sulphur wash. Of all these mixtures the lime-sulphur-salt and Bordeaux mixture gave the best results, and this is of practical importance on account of its combining both insecticidal and fungicidal properties. This mixture was obtained by making lime-sulphur-salt wash in the usual way, to which 1 lb. copper sulphate was added to 11 gal. of the mixture. The authors conclude as a result of their experiments that no special apparatus is required for the application of the lime-sulphur-salt wash, that the wash does not readily spread, and hence should be applied carefully, that the application should be made a short time before the buds begin to swell, and that this wash is a highly effective and safe treatment for trees infested with San José scale.

Spraying for the San José scale with the lime-sulphur-salt and other washes, F. H. Hall, V. H. Lowe, and P. J. Parrott (*New York State Sta. Bul. 228, popular ed., pp. 8*).—A popular summary of the above bulletin.

Orchard treatment for the San José scale, H. T. Fernald (*Massachusetts Sta. Bul. 86, pp. 15*).—In the fall of 1901 the station orchard was found to be badly infested with San José scale. The orchard consisted of apple, pear, cherry, peach, plum, prune, and quince trees, numbering 612 in all. On the following March 27 treatment was begun and was continued until April 14. No injurious effects to the trees were produced by any of the different methods of treatment. The method of determining results consisted in inspecting the trees as soon as the first young larvæ appeared, June 23, followed by a reinspection every week or two during the summer and fall. A potash-whale-oil soap, used at the rate of 2 lbs. to a gallon of water, freed only 28.12 per cent of the trees from the scale. Another potash-whale-oil soap gave better results, freeing 52.6 per cent from the scale. A whale-oil-tobacco soap was perfectly effective in 53.8 per cent of cases, while the following percentages of effectiveness were obtained by the other insecticides: Insect soap, 40.7 per cent; agricultural soap, 33⅓ per cent; crude petroleum in a 30 per cent mixture with water, 43.2 per cent; kerosene in a 36 per cent mixture with water, 44.4 per cent; lime-sulphur-salt wash, 65.6 per cent. The relative cost of materials per tree was as follows: Fumigation, 8 cts.; potash-whale-oil soap, 8 cts.; potash-whale-oil-tobacco soap, 9 cts.; agricultural soap, 4 cts.; crude petroleum, 4 cts.; kerosene, 4¼ cts.; lime-sulphur-salt wash, 5 cts.; insect soap, 12 cts. A few badly infested trees were sprayed July 2 with 10 per cent kerosene, and good results were obtained. A majority of the young scales were destroyed without injury to the trees. The author concludes from his experiments that the best method of treatment of orchard trees, where they are small, is by fumigation, while lime-sulphur-salt wash is the most satisfactory and effective spraying material.

San José scale, E. D. Sanderson (*Delaware Sta. Bul. 58, pp. 16, pls. 4*).—This insect is described and notes are given on its origin, life history, means of distribution, and food plants. The remedies suggested by the author are cutting and pruning badly infested trees and treating other trees with kerosene emulsion, mechanical mixtures of kerosene or crude petroleum with water, whale-oil soap, and lime-sulphur-salt wash. Plum and pears treated with a mixture of crude petroleum containing 20 to 25 per cent of oil killed the scales without injuring the leaves. Fumigation with hydrocyanic gas is recommended as the most satisfactory treatment for small and medium sized trees.

Canadian experience in the use of lime, sulphur, and salt for San José scale, G. E. Fisher (*Proc. West. New York Hort. Soc. 1902, pp. 134–137, figs. 2*).—Brief notes are given on the use of crude petroleum, kerosene, and kerosene emulsion in the destruction of San José scale, together with an account of the use and value of the lime-sulphur-salt wash for this purpose. The latter remedy was found to be very satisfactory and is recommended as being perfectly effective and safe, even when applied by ordinary farm workmen.

Notes on lime-sulphur-salt wash as an insecticide, C. W. Mally (*Ent. News, 13 (1902), No. 7, pp. 223–230*).—The author's experiments with this insecticide in combating *Diaspis pentagona* in Cape Colony is briefly related. Various formulæ were used, in which the amount of lime was varied and in some of which the sulphur and in others the salt and sulphur were omitted. From the author's experiments it is concluded that none of these formulæ is very efficient under South African conditions in the destruction of *D. pentagona* in the adult condition. The young larvæ are destroyed for a period of 3 months after the application. Frequent rains seem to have a favorable action upon the effectiveness of the insecticide.

Insect enemies of the apple tree and its fruit, L. Bruner (*Trans. Amer. Apple Growers' Cong., 1902, pp. 100–106*).—Notes on the extent of insect injuries to apples throughout the country, together with a brief account of general remedies to be applied in controlling these insects and an analytical key for use in determining the various species.

Tent caterpillars, W. N. Hutt (*Utah State Farmers' Inst. Rpt. 1902, pp. 70–74, fig. 1*).—The tent caterpillar is reported as causing great injury to the terminal branches of fruit trees. Notes are given on the habits, life history, and remedies for this species.

A study of the parasites of the American tent caterpillar, W. F. Fiske (*New Hampshire Sta. Tech. Bul. 6, pp. 181–230, figs. 7*).—The author made continued observations on the parasites of the American tent caterpillar for a period of 4 years. It is estimated that the average number of caterpillars destroyed by parasites annually varies from 15 to 20 per cent. In 1900 it was 17.4 per cent. A table is given showing the comparative seasonal abundance of the 11 primary parasites of the tent caterpillar which were studied by the author. The primary parasites are as follows: *Pimpla conquisitor, P. inquisitor, P. pedalis, Limneria fugitiva*, a species of Anomalon, *Ameloctonus clisiocampæ, Cryptus extrematus, Rhogas intermedias, Bracon gelechias, Diglochis omnivorus*, and *Apanteles clisiocampæ*. The latter species and Ameloctonus are described as new. A number of the primary parasites serve in turn as hosts to secondary parasites, or sometimes become themselves secondary parasites. Notes are given on a number of the more important secondary and tertiary parasites.

Grapevine-root worm, E. P. Felt (*New York State Mus. Bul. 59, 1902, pp. 49–84, pls. 6*).—An outbreak of this insect occurred in Chautauqua Co., N. Y., in the neighborhood of Ripley, where about 80 acres of grapes were destroyed. The infested area is described and notes are given on signs by which the presence of the insect may be known, and on the present conditions of infestation by this insect in the Ohio grape belt. The species is described in its different stages and notes are given on its life history. The number of eggs laid by female beetles varied between 106 and 184. The duration of the egg stage, as determined by the author, was from 9 to 12 days. Experiments were devised for the purpose of testing the burrowing power of the larvæ. A glass tube ½ in. in diameter and 17 in. in length was bent so that 4 in. were vertical, and filled with loose earth. Grubs placed on the surface of the soil in the vertical part of the tube made their way down into the soil and through the whole length of the tube within a few days. One grub made its way through 7½ in. of tightly packed soil within 6 days. It was found that the larvæ were able to exist for a considerable time without food. The insect feeds chiefly on grapes, but is also known to attack the Virginia creeper and occasionally other plants. A number of experiments were made in testing remedies for controlling this insect, and as a result of these experiments it is recommended that the soil be thoroughly stirred between the rows and near to the vines, so that the insects may be exposed in their pupal condition. The beetles may be collected by special catchers so constructed that they may be operated rapidly, and these remedies may be supplemented by thorough spraying, preferably with arsenate of lead. It appears that no one method can be entirely relied upon to control the insect. A brief bibliography of the species since 1866 is also given.

Some diseases of the potato and of fruit trees, A. Linton (*Jour. Khediv. Agr. Soc. and School Agr., 4 (1902), No. 5, pp. 197–208, pls. 4*).—Brief notes on the biology of insects, with a special account of the habits and life history of leopard moth, plum-stem borer, and a number of scale insects, together with a brief discussion of peach-leaf curl.

Sugar-cane borers—insecticides and fungicides, P. Bonâme (*Sta. Agron. Mauritius, Bul. No. 7, 1902, pp. 28*).—The common sugar-cane borer of Mauritius is not *Diatræa saccharalis*, but *Sesamia nonagrioides*. Notes are given on the habits and life history of this species, a translation of a note on the sugar-cane borer by H. Maxwell-Lefroy is presented, and a brief discussion is given of the formulæ and method of applying common insecticides and fungicides.

Cabbage-root maggots, G. H. Carpenter (*Jour. Dept. Agr. and Tech. Instr. Ireland, 3 (1902), No. 1, pp. 109–113, pl. 1*).—Biological and economic notes on *Phorbia brassicæ*. The species is reported as having occurred in unusual numbers during the year 1901. In combating this insect it is recommended that close attention be given to the plants in order to determine the egg-laying period, and that eggs should be destroyed at once. A dressing of gas lime has been found useful in keeping off the flies. The use of tarred cards around the stem of young plants may be relied upon to some extent in preventing the deposition of the eggs. Brief notes are given on the natural enemies of this insect.

Australian ladybird beetles, W. W. Froggatt (*Agr. Gaz. New South Wales, 13 (1902), No. 9, pp. 895–911, pl. 1*).—Notes are given on the habits and life history of a number of species of Coccidæ belonging to the genera Epilachna, Coccinella, Callineda, Verania, Leis, Orcus, Novius, Rhizobius, Cryptolæmus, and Scymnus. A short bibliography of works relating to Australian Coccidæ is appended to the article.

The flea beetles—their life history, economical importance, and remedies against them, A. C. Jensen (*Tidsskr. Landökon., 21 (1902), No. 6, pp. 379–393*).

Screw worms in St. Lucia, St. G. Gray (*British Med. Jour., 1903, No. 2204, pp. 724, 725*).—Descriptive biological and economic notes are given on this insect. The author briefly discusses the distribution of this species and the nature of its attacks upon man and animals.

New Geometridæ and microlepidoptera from the European faunal region, A. Fuchs (*Stettin. Ent. Ztg., 63 (1902), No. 1, pp. 315–330*).—Descriptive and economic notes on *Crambus pascuellus*, *Tortrix corylana*, *Gelechia caminariella*, and related species.

Hymenoptera of Valais, E. Frey-Gessner (*Bul. Murithienne, Soc. Valais. Sci. Nat., 1902, No. 31, pp. 21–80*).—A monographic account of the genus Halictus. A brief bibliography relating to this genus is compiled by the author and analytical keys are presented for the determination of the males and females belonging to the various species, some of which are described as new.

On the Hymenoptera collected by Mr. Robert Shelford at Sarawak, and on the Hymenoptera of the Sarawak Museum, P. Cameron (*Jour. Straits Branch Roy. Asiatic Soc., 1902, No. 37, pp. 29–140*).—Descriptive and biological notes on a large number of species of sawflies, Ichneumonidæ, Mutillidæ, and other families of Hymenoptera. Many of the species are described as new.

The wharf borer (Nacerdes melanura), T. Broun (*New Zealand Dept. Agr. Rpt. 1902, pp. 460–463, pl. 1*).—This insect was found in large numbers in wooden blocks used for paving purposes. The upper surface of the blocks had been asphalted and were not injured to the same extent as the lower portions. The insect is described in its various stages.

Parasites of Oiketicus platensis, C. Schrottky (*An. Mus. Nac. Buenos Aires, 8 (1902), No. 1, pp. 45–48*).—In addition to *Smicra bergi*, which was already known as a parasite of this insect, the author reports 2 other parasites, *Pimpla brasiliensis* and *P. tricolor*.

Metamorphoses of Uroplata costipennis, J. Brèthes (*An. Mus. Nac. Buenos Aires, 8 (1902), No. 1, pp. 13–17, figs. 9*).—This insect lays its eggs on the under side of the leaves of *Sida rhombifolia*. Descriptive and biological notes are given on the insect in its various stages.

Contribution to a knowledge of the Rutelidæ, F. Ohaus (*Stettin. Ent. Ztg., 63 (1902), No. 1, pp. 1–57, figs. 10*).—Notes are given on the habits and life history of a number of species of Anomala and related genera. Descriptions are given of all these species, some of which are new.

On some parasites of Xylocopa tenuiscapa, E. E. Green (*Ent. Mo. Mag., 2. ser., 8 (1902), No. 154, pp. 232, 233, fig. 1*).—In trees tunneled by this insect the author found numerous specimens of *Cissites debeyi* in all stages. It is suggested that these beetles may be carried from one nest to another attached to the legs of their host. A parasitic mite (*Greenia parkinsi*) was also found associated with the bees.

Nursery inspection, C. M. Weed (*New Hampshire State Bd. Agr. Circs. 1–3, 1903, folios*).—The text is given of the recent New Hampshire law authorizing the State board of agriculture to appoint a State nursery inspector and to provide for the protection of trees and shrubs from injurious insects and diseases. The attention of the public, nurserymen, tree agents, and express and freight agents is called to the nature and provisions of this law.

The effects of drought upon insect life, Mary E. Murtfeldt (*Trans. Amer. Apple Growers' Cong. 1902, pp. 119–121*).—On account of the unusual drought in the Mississippi Valley in 1901 the hope was entertained that injurious insects would be unfavorably affected thereby. These expectations, however, were not realized, since the common noxious insects were present during the following season in as large numbers as usual.

Lantern trapping, E. J. Smith (*Ent. News, 13 (1902), No. 7, pp. 207–209*).—A description is given of a lantern which is said to have proved very efficient in capturing moths for museum specimens. With regard to the economic value of the trap the author believes that the device is worse than useless, the number of injurious insects captured being very few.

Spray calendar (*Oregon Bd. Hort. Rpt. 1902, pp. 70–90*).—Formulæ are given for the preparation of approved insecticides and fungicides, together with brief directions for the application of these remedies in combating common insect and fungus pests.

Insecticides and fungicides, A. B. Cordley (*Oregon Sta. Bul. 75, pp. 21–43*).—The nature of insecticides and fungicides is briefly discussed and notes are given on the methods of preparation and application of the better known substances of these classes. A brief list of plants is given in alphabetical order, with notes on some of the more important insect and fungus diseases to which they are subjected and recommendations regarding means of controlling these pests.

Paris green, W. C. Stubbs (*Louisiana Stas. Bul. 73, 2. ser., pp. 174–176, 190, 191*).—The results of examinations of 71 samples under the provision of the State law are reported.

Contribution to the knowledge of Anopheles, W. Dönitz (*Ztschr. Hyg. u. Infectionskrank., 41 (1902), No. 1, pp. 15–88, pls. 2*).—Detailed biological descriptive and economical notes are given on a number of species of Anopheles collected from various tropical localities.

The structure and biology of Anopheles maculipennis, G. H. F. Nuttall and A. E. Shipley (*Jour. Hyg. [Cambridge], 2 (1902), No. 1, pp. 58–84*).—Notes on the resting position of the adult, the geographical distribution of the species, habitat, modes of dissemination, migration, hibernation, longevity, egg laying, number of generations, food, and influence of heat, cold, light, color, and sound upon the mosquitoes. A brief bibliography of related literature is appended to the article.

Characters of some mosquito larvæ, J. B. Smith (*Ent. News, 13 (1902), No. 10, pp. 299–303, pl. 1*).—Extensive collections of mosquitoes were made for the purpose of studying the anatomy and habits of the larvæ. Notes are given on the characters and habits of the larvæ of a number of species.

Notes on the early stages of Culex canadensis, J. B. Smith (*Ent. News, 13 (1902), No. 9, pp. 267–273*).—This species is said to be a common one in moist woodlands of New Jersey. Brief notes are given on the habits of the larvæ, which is said to prefer woodland springs and pools or ditches carrying spring water. The author never observed the larvæ in stagnant open water. A detailed description is given of the larvæ of this species.

Selecting the locality for an apiary, R. Beuhne (*Jour. Dept. Agr. Victoria, 1 (1902), No. 9, pp. 908, 909*).—Attention is called to the effect of locality, and especially of the honey plants upon the color and other characters of the honey obtained. The author enumerates a number of plants which are valuable in the production of honey. Bee raisers are advised to locate their apiaries near red gum, yellow box, and gray box.

A scent-producing organ in the abdomen of the worker of Apis mellifica, F. W. L. Sladen (*Ent. Mo. Mag., 2. ser., 8 (1902), No. 153, pp. 208–211, fig. 1*).—In studying the phenomenon of humming in bees the author was led to investigate an abdominal organ in workers which was described by Nassanoff in 1883. It was found that this organ was capable of emitting a peculiar odor which may be of use to the bees in signaling to one another.

FOODS—NUTRITION.

Experiments on the metabolism of nitrogen in man, E. Landergren (*Skand. Arch. Physiol., 14 (1903), No. 1–3, pp. 112–175, pl. 1*).—Experiments with man are reported which were made with the special object of learning the minimum amount of protein required. In general the diet contained a limited amount of protein with an abundance of carbohydrates, or fat or both, to supply energy, while in one case the subjects fasted.

When a limited amount of protein was supplied under the experimental conditions the body reached after a few days a condition when apparently not more than 3 or 4 gm. of nitrogen was metabolized per day. Provided a minimum quantity of carbohydrates is present, the amount not being definitely known, the author regards it probable that fat protects protein as well as an isodynamic quantity of carbohydrates, both in a condition of nitrogen hunger and nitrogen abundance. It was noted that under certain conditions fat exhibited less than one-half its protective power when carbohydrates were absent. This the author believes is explained by the fact that when carbohydrates are no longer supplied some must be formed in the body from protein, and that fat can not serve for this purpose in the place of protein. In other words, as soon as the glycogen is no longer present in the body fat is inferior to carbohydrates as a protector of protein.

This question and related topics, including the cleavage of protein during fasting, are discussed at length with special reference to the author's results and those obtained by other investigators.

Concerning the metabolism of phosphorus in adult man, R. Ehrström (*Skand. Arch. Physiol., 14 (1903), No. 1-3, pp. 82-111, figs. 2*).—The author's experiments were made with 3 men, and the foods and excretory products were analyzed. The excretion of nitrogen and of phosphorus were not found to be parallel, the quantity of nitrogen being influenced by the protein content of the body and the quantity of phosphorus by the quantities of phosphates dissolved in body fluids, the amount in the skeleton, and also by the amount of lecithin and protein containing phosphorus.

The author concludes, therefore, that it is not necessary in metabolism experiments to calculate the ratio of nitrogen to phosphorus. As regards the metabolism of this element, the author notes that the amount of phosphorus present in food is one of the factors which affects the amount metabolized. The body has not the same tendency to accumulate phosphorus and reach a condition of equilibrium as is observed with nitrogen. Within limits at least, the metabolism of phosphorus is thought to be regulated in the same way as that of fat. That is, it can be stored up in the body or drawn upon, according to circumstances, for comparatively long periods. Further experiments on this point are regarded as essential. Apparently there is a minimum phosphorus requirement which varies within rather narrow limits, 1 to 2 gm. per day, supplied by an ordinary mixed diet, being, in the author's opinion, about the needed quantity.

The amount of phosphorus digested, the form in which it is best fitted for resorption in the body, the form in which phosphorus occurs in urine, the metabolism of nitrogen, and other topics are discussed.

The effect of different variables upon the excretion of carbon dioxid during positive muscular work, J. E. Johansson and G. Koraen (*Skand. Arch. Physiol., 14 (1903), No. 1-3, pp. 60-81, dgm. 1*).—Continuing earlier work (E. S. R., 14, p. 992) experiments in which the respiratory quotient was determined are reported on the effects of training, duration of work, speed at which it is performed, and some similar factors upon positive muscular work, which consisted in raising and lowering a weight with the aid of apparatus of special construction. The authors conclude that in harmony with earlier observations the carbon dioxid excretion is directly proportional, within certain limits determined by practice or training, to the number of muscular contractions. It also appeared that with positive muscular work the carbon dioxid excretion was dependent upon the manner and duration of the muscular motion as well as the amount of external work produced. The effect of duration is greater in so far as it represents the duration of the muscular contractions in successive phases of motion. The experimental data are further discussed at some length.

The artificial method for determining the ease and rapidity of the digestion of meats, H. S. Grindley and T. Mojonnier (*Univ. Illinois, Univ. Studies, 1 (1903), No. 5, pp. 3-20*).—The results of a considerable number of digestion experiments with raw and cooked beef are reported and the experimental methods described. According to the authors the results indicate that there is a difference in the ease and rapidity of digestion of the protein of raw meat and meat cooked by the common methods, the difference being most noticeable in the results of experiments in which the samples were digested with pepsin solution for 1 hour.

The data presented are not regarded as sufficient for final deductions, but, according to the authors, "it does seem that the protein of raw meat is more readily soluble or digestible than the protein of cooked meats. The experiments also indicate that the protein of meat cooked by boiling is more readily digestible than the protein of broiled or fried meats. The protein of fried meats is less rapidly soluble or digestible than broiled meat. These same differences are also noticeable in the results obtained after continuing the digestion for 2 hours, but after longer digestion these differences mostly disappear and after digesting with pepsin solution for 24 hours the digestibility of raw and cooked meats seems to be practically the same. Further, the results here reported show that the method of artificial digestion [as modified by the authors] gives a ready means of determining the relative ease and the rapidity of the digestion of the protein of foods."

In some of the experiments formalin was added after digestion had continued for a definite time and the material allowed to stand 24 hours before filtering. It is believed that the results indicate that formalin can be thus used for stopping the action of pepsin solution, but it is planned to investigate the subject further and test phenol and other substances also.

Calorimetric examinations of milk, A. SCHLOSSMANN (*Ztschr. Physiol. Chem., 37 (1903), No. 4, pp. 337–349*).—The author reports determinations of the heat of combustion of a number of samples of human milk, as well as that of the cow, goat, and ass, and concludes that this value may be calculated accurately with the aid of factors.

The technique of calorimetric analytical methods, A. SCHLOSSMANN (*Ztschr. Physiol. Chem., 37 (1903), No. 4, pp. 324–336*).—The method of determining heat of combustion with a Hemple bomb calorimeter is described and discussed.

Infant feeding (*Maine State Bd. Health Rpt. 1900–1901, pp. 181–280, figs. 3*).—Infant feeding, modified milk, and related topics are discussed, as well as the management of dairies in connection with the production of milk for the artificial feeding of infants.

The value of macaroni wheat for bread making, E. C. CHILCOTT (*South Dakota Sta. Bul. 77, pp. 29–38, figs. 4*).—The fact that macaroni wheats can be satisfactorily used for bread making is pointed out, and directions for its successful use and recipes by Alice D. Feuling are given. It is stated that the yeast fermentation proceeds more rapidly with macaroni wheat flour than with ordinary flour, that is, that the bread is raised more quickly.

The chemical and milling properties of macaroni wheat, J. H. SHEPARD (*South Dakota Sta. Bul. 77, pp. 39–42*).—A test made with a roller mill of a size suited for laboratory experimenting showed, according to the author, that macaroni wheat offered no special difficulties in milling, although the grains are "harder and require more power for their reduction than the ordinary bread wheats."

Modifying the milling processes slightly a sample of Kubanka macaroni wheat gave 6.38 per cent bran, 20.83 per cent shorts, and 71.54 per cent flour. The bran contained 16.3 per cent protein, the shorts 17.4 per cent, and the flour 16.9 per cent. The flour gave, according to the author, 54.8 per cent of wet gluten and 18 per cent dry gluten. "The difference between the wet and dry gluten shows the water-holding power of the macaroni flour to be all that could be desired." Data are also reported regarding the protein content of a number of samples of wheat which seem to show that the local-grown macaroni wheat contains more protein than the original seed.

Impurities in American wheat, A. L. WINTON (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 10, pp. 432–447, figs. 16*).—The principal weed seeds which are found in wheat are described with special reference to their identification by microscropical methods.

Concerning the composition and digestibility of several sorts of Norwegian flat bread, S. TORUP and P. W. K. BÖCKMANN (*Arch. Math. og Naturvidensk., 24 (1901); abs. in Centbl. Agr. Chem., 32 (1903), No. 4, pp. 235–240*).—The digestibility of a kind of unfermented bread called "flat bread," made from oats and from barley, was studied in experiments with man, the income and outgo of nitrogen being also determined. The average digestibility of the oat bread with butter was: Dry matter 76.6 per cent, protein 63.7, fat 95, nitrogen-free extract 82.2, crude fiber 6.7, soluble ash 31.8, and insoluble ash 0.05 per cent. The average digestibility of the barley bread and butter was: Dry matter 86.1 per cent, protein 77.8, fat 95.3, nitrogen-free extract 91.3, crude fiber 6.6, soluble ash 51.5, and insoluble ash 0.3 per cent.

According to the authors, the Norwegian hard flat bread made without ferments is as well digested by healthy men as fermented bread. The crude fiber (from the hull) hinders markedly the digestibility of protein and carbohydrates. On the other hand, the digestibility of the fat of the butter eaten with the bread was little, if at all, affected. A considerable amount of the material ordinarily estimated as crude fiber was digested.

Aids to bread baking, O. VON CZADEK (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 2, pp. 195, 196*).—Analyses are reported of commercial products which are said to increase the activity of yeast.

The baker's book, E. BRAUN (*New York: Author, Vol. I, pp. 306, pls. 9, figs. 99*).—This publication, which contains information of use to bakers and those interested in this trade, includes a number of descriptive, historical, and miscellaneous articles on bread and bread making, and other data, gathered from a variety of sources.

Chemical composition of cooked vegetable foods, KATHARINE I. WILLIAMS (*Proc. Chem. Soc. [London], 19 (1903), No. 262, p. 66*).—The vegetable foods analyzed include raw and cooked broccoli, Brussels sprouts, dried peas, oatmeal, and macaroni.

Asphodelus tenuifolius, an Indian famine food, A. GHOSE (*Agr. Ledger, 1902, No. 7 (Veg. Prod. ser., No. 72), pp. 155–157*).—The plants and seeds of *Asphodelus tenuifolius* are eaten in India in times of need. As shown by a chemical analysis, the seed contains fairly large amounts of protein, fat, and carbohydrates. Extracts from the seed were tested for alkaloids, but none was found. A test with iodin failed to indicate the presence of starch, nor was sugar detected. The seed contained about 25 per cent fat, the properties of which were studied to some extent.

The examination and utilization of horse-chestnuts, LAVES (*Oesterr. Chem. Ztg., 5 (1902), No. 22, pp. 511, 512*).—In a paper presented before a meeting of the German Naturalists and Physicians attention is called to the food value of horse-chestnuts which have been treated with alcohol to remove the glucosid and bitter material present.

Concerning sulphured dried fruit, A. BEYTHIEN and P. BOHRISCH (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 8, pp. 356–360*).—Experimental data are reported regarding the occurrence of sulphurous acid in dried fruits, the subject being discussed from a hygienic standpoint.

Coffee substitutes (*Agr. News [Barbados], 2 (1903), No. 28, p. 148*).—A brief note on the use of gumbo seed (*Abelmoschus*, or *Hibiscus, esculentus*) as a substitute for coffee.

Pineapple wine, A. SALLES (*Rev. Agr. [São Paulo], 8 (1902), No. 78, pp. 14–17*).—The manufacture of wine from pineapples is described and discussed.

Pineapple wine, H. NEUVILLE (*Jour. Agr. Trop., 3 (1903), No. 21, pp. 70–72*).—A critical discussion of the production of pineapple wine based on the article referred to above.

Food adulteration in Wyoming, E. E. SLOSSON (*Wyoming Sta. Bul. 56, pp. 34*).—

The text of the Wyoming pure food law is quoted, existing conditions discussed, and the results of a number of examinations, which were made in carrying out the provisions of the law, are reported.

Report on the examination of foods, drugs, and public water supplies, R. O. Brooks (*Trenton: Edwin Fitzgeorge, 1903, pp. 30*).—The results of the examinations made at the chemical department of the New Jersey State Laboratory of Hygiene of samples of chocolate, cocoa, coffee, flavoring extracts, honey, milk, maple and other sirups, molasses, olive oil, spices and condiments, drugs, mineral waters, potable waters, etc., are reported. A number of samples of meat and meat products, butter, and grape juice were examined for added preservatives. None were found in the butter, grape juice, and mince-meat examined. Boric acid was found in 1 sample of sausage meat, 2 of Hamburger steak, and 1 of potted ham.

National association of State dairy and food departments (*Jour. Proc. Sixth Ann. Conv. Nat. Assoc. State Dairy and Food Depts., pp. 504*).—This volume includes the proceedings of the sixth annual convention of the National Association of the State Dairy and Food Departments held at Portland, Oreg., and a summary of the State pure food laws, court decisions, etc. The volume was compiled by H. B. Meyers.

The household food supply of the United Kingdom, R. E. Turnbull (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 15 (1903), pp. 197–211*).—A statistical article.

Relations of population and food products in the United States, J. H. Blodgett (*U. S. Dept. Agr., Division of Statistics Bul. 24, pp. 86*).—A statistical article treating of the most important food products based largely, according to the author, upon the Census reports from 1850 to 1900. Some of the causes of the increase or decline observed in the production or use of different materials are discussed as well as other general matters.

The food factor in education (*British Med. Jour., 1903, No. 2205, pp. 797–800*).—A discussion of the character of the diet furnished in schools in England and the importance of adequate food for young and growing students. A number of examples of school diets are given.

Text-book of hygiene, M. Rubner (*Lehrbuch der Hygiene. Leipzig and Vienna: Franz Deuticke, 1903, 7. ed., pp. XII + 982, figs. 295*).—In the new edition of this important work the author states that new material has been added, especially the results of investigations carried on since the last edition. The volume, which is designed for the use of students of medicine, physicians, sanitary officials, etc., contains chapters on food and condiments in addition to the other topics usually treated of under the general subject of hygiene.

ANIMAL PRODUCTION.

Variation in animals and plants, H. M. Vernon (*New York: Henry Holt & Co., 1903, pp. IX + 415, figs. 30*).—The 3 general subjects discussed in this volume are the facts of variation, the causes of variation, and the relation of variation to evolution. The following topics serve as titles to chapters under this threefold division of the book, viz.: Measurements of variation; dimorphism and discontinuous variation; correlated variations; blastogenic variations; laws of variation; effects of temperature, light, moisture, salinity, food, products of metabolism, and general conditions of life on variation; action of natural selection on variations; and adaptive variations.

The variation of animals is treated at greater length than that of plants. The author states that the keynote of much of the recent work on variation is the recognition of the fact that all problems in this field, in order to be studied effectively or be solved in a satisfactory manner, must be formulated in mathematical terms. It is no longer considered sufficient merely to state that a certain variation occurs to a greater or less degree; it is necessary to state the exact amount of variation so far as it can be measured, and the proportion of cases in which it occurs, in order to make it possible to determine the degree of importance of any variation in the development of the species.

The author critically discusses the recent work of Bateson, de Vries, Poulton, Weldon, Vines, and many other writers, including the theory of variation proposed by Mendel.

Practical manual of animal feeding, R. Dumont (*Manuel pratique de l'alimentation du bétail. Paris: J. B. Baillière & Son, 1903, pp. 360*).—This volume, which is one of the Bibliothéque des Connaissances Utiles, includes the general principles of animal feeding, feeding stuffs and their digestibility, and the practical feeding of farm animals, a number of tables of the composition of feeding stuffs, etc., being appended.

The inspection of feeding stuffs in 1902, F. W. Morse (*New Hampshire Sta. Bul. 98, pp. 15-23*).—In carrying out the provisions of the State feeding stuff law, which is quoted, analyses were made of 57 samples of cotton-seed meal, linseed meal, gluten meals and feeds, hominy meal, commercial feeds, and cereal breakfast food by-products, poultry feeds, meat and bone meals, and calf meal. According to the author, the results of the analyses showed a satisfactory condition as regards quality, since "there are but few serious deficits in the goods as guaranteed."

Using vine prunings and grape marc with molasses for making molasses feeds, L. Grandeau (*Jour. Agr. Prat., n. ser., 5 (1903), No. 9, pp. 277, 278*).—Data are quoted regarding the nutritive value of vine prunings and grape marc, which led to the deduction that such materials combined with molasses would make satisfactory feeding stuffs.

Industrial by-products used in the manufacture of molasses feeds, L. Grandeau (*Jour. Agr. Prat., n. ser., 5 (1903), No. 1, pp. 9-11*).—This article is based on experiments reported by O. Kellner. (See below.)

Preparation and use of molasses bread for cattle feeding, G. Malet (*Bl. Zuckerrübenbau, 9 (1902), No. 19, pp. 295-299*).—Molasses bread for horses and for cows is described and the composition of the 2 sorts quoted. An experiment is also reported which, according to the author, shows that molasses bread to the amount of 3 kg. may form a part of the ration of horses. With cows it was found that molasses bread caused gains in weight but exercised no influence upon the quality or quantity of the milk. It is also stated that it facilitated and hastened the fattening of pigs.

The keeping qualities of certain peat-meal-molasses feeds, A. Herzfeld, O. Schrefeld, and K. Stiepel (*Ztschr. Ver. Deut. Zuckerind., 52 (1902), No. 554, p. 207; abs. in Centbl. Agr. Chem., 32 (1903), No. 4, pp. 252-256*).—Experimental data are reported and discussed.

Experiments on the digestibility of a number of materials used as absorbents in molasses feeds, O. Kellner et al. (*Deut. Landw. Presse, 29 (1902), No. 103, p. 832; abs. in Centbl. Agr. Chem., 32 (1903), No. 4, pp. 233-235*).—In experiments with sheep the digestibility of mowrah meal, coffee hulls, peanut shells, and cocoa hulls was studied.

The protein of ground whale flesh, A. Kavli (*Norsk Landmandsblad, 21 (1902), pp. 281, 282; abs. in Centbl. Agr. Chem., 32 (1903), No. 2, pp. 120-122*).—The author has reported an extended study of the composition of the nitrogenous constituents of ground whale flesh, a concentrated feed extensively used in Norway, especially for milch cows.

The energy of growth and the lecithin in decoctions of cereals, M. Springer (*L'énergie de croissance et les lécithines dans les décoctions de céréales. Paris: Masson & Co., pp. 170*).—The author believes that lecithin plays an important part in the growth of animals, and in this volume, which is one of the series Encyclopédie Scientifique des Aide-Mémoire, he has gathered together the results of numerous investigations which have a bearing upon this subject, the material being critically discussed. The lecithin in a decoction made from a mixture of cereals he regards as of importance in inducing growth.

Concerning the glucose and proteid material of a ration, L. Duclert (*Ann. École Nat. Agr. Montpellier, n. ser., 2 (1903), No. 3, pp. 212-223*).—Different amounts of glucose were fed to rabbits alone and in combination with alfalfa. The conclusion is drawn that unless the quantity eaten was excessive, glucose was thoroughly assimilated and did not exercise an effect upon the digestibility of protein.

The influence of hydroxile ions on tryptic digestion, A. Kanitz (*Ztschr. Physiol. Chem., 37 (1902), No. 1, pp. 75-86*).—Laboratory experiments are reported and discussed.

On the variations in the mineral, combined, and organized phosphorus in animal tissues, A. L. Percival (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 22, pp. 1005-1007*).—Analyses are reported showing the relative proportions of mineral, combined, and organized phosphorus in a number of substances of animal origin. Some of the results follow:

Distribution of phosphorus in some animal products.

	Water.	Phosphorus (estimated as P_2O_5).			
		Total.	Mineral.	Combined.	Organic.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Muscles (beef)	72.97	0.507	0.217	0.095	0.193
Heart (mutton)	77.58	1.011	.380	.305	.268
Intestine (pig)	77.58	.293	.108	.146	.038
Spleen (beef)	75.03	.570	.176	.304	.056
Liver (beef)	68.99	.561	.264	.235	.062
Pancreas (beef)	69.21	.749	.366	.369	.013
Thymus (mutton)	76.56	1.223	.454	.733	.025
Brain (mutton)	76.75	.638	.148	.370	.115
Kidney (mutton)	79.11	.458	.232	.192	.030

The analytical methods are briefly described, and the results obtained are discussed.

Phosphates in the feeding of animals, A. Gouin and P. Andouard (*Les phosphates dans l'alimentation du bétail. Nantes: C. Mellinet, 1903, pp. 37*).—The principal material containing phosphoric acid which was used in the authors' experiments with calves was powdered green bone, which was fed with a basal ration of skim milk and starch, or skim milk, oats, and coarse fodder. In some cases phosphoric acid was also tested.

Judged by these experiments a calf a month old would tolerate 6.5 gm. of powdered bone per 10 kg. body weight and digest the phosphoric acid contained quite thoroughly. The phosphoric acid was well assimilated and the amount excreted in the urine was not less than 85 per cent of the amount assimilated. The amount of nitrogen and phosphoric acid in the food and excretory products is recorded in the 2 experiments reported, each of which extended over some 6 weeks.

The authors believe that in the form of powdered bone phosphoric acid exercises a very favorable effect on the nutrition of young ruminants, increasing the amount of nitrogen retained in the tissues and at the same time increasing the chemical changes in the body which result in the formation of body heat. In connection with the work the digestibility of oats was determined.

Cassava as a feed stuff, J. C. Brünnich and W. Maxwell (*Queensland Agr. Jour., 12 (1903), No. 1, pp. 65-67*).—In connection with a study of the feeding value of cassava determinations are reported of the amount of hydrocyanic acid in young and old roots grown in Queensland. In view of the amount found the authors believe that farmers should be warned not to use cassava, in its natural state, as a human food or as a feeding stuff for animals.

Experiments on the possibility of removing the poisonous material by extraction with hot or cold water are briefly reported, which led to the following deduction: "While the cassava root in its natural state contains a highly dangerous amount of hydrocyanic acid, yet by treatment of the cut-up material with water, it can be rendered quite safe for food purposes. As a practical suggestion, it is advised that the cassava roots, if used at all, should be cut up into pieces and boiled in the same manner as potatoes are boiled for pig feed, the greatest care being taken that the water shall be completely removed, and the material further washed out with additional water. Concerning the actual amount of hydrocyanic acid found in cassava root by different scientists and in different countries, the indications are very strong that the controlling factors will be found to be the nature of the soil and climatic conditions."

Home produce v. purchased food, J. A. Voelcker (*Jour. Roy. Agr. Soc. England, 63 (1902), pp. 330-338*).—Continuing earlier work (E. S. R., 8, p. 248) on the value of home-grown and purchased feeding stuffs, a test was made with 2 lots, each containing 8 cross-bred steers. After a preliminary feeding, each lot was fed 8 lbs. of grain per head daily in addition to 30 lbs. of roots, 4 lbs. hay, and 7.5 lbs. straw chaff, the amounts being increased as the test progressed. In the case of the home-grown products the grain ration consisted of beans, oats, and wheat, 7:5:4, and in the case of purchased feeds it consisted of linseed cake, decorticated cottonseed cake, and maize meal in the same proportions. All the feeding stuffs used were analyzed.

Four steers in each lot were fed in stalls, the others in yards, the former averaging 1,319 lbs. in weight at the beginning of the trial and the latter 1,449 lbs. The test covered from 84 to 106 days, the different groups being sold for slaughter at different times as they were ready. The steers fed home-grown products in stalls made an average daily gain per head of 1.5 lbs., and those fed the same products in yards 1.93 lbs. In the case of the purchased feed, the average daily gain with the steers fed in stalls was 1.98 lbs. and of those fed in yards 2.38 lbs.

Data are also reported regarding the cost of feed and live and dressed weight. The author calls attention to the fact that while smaller and more costly gains were made on the home-grown products the meat produced was considered superior.

[Gains made by steers on pasturage], Supplement to Bulletin No. 73, H. W. Mumford (*Illinois Sta. Circ. 61, pp. 2*).—The effect of previous feeding on subsequent gains made on pasturage was studied with 2 lots, each containing 25 yearling steers used in a test previously reported (E. S. R., 14, p. 381), on the comparative merits of corn silage and shock corn. In 175 days on blue grass pasturage the steers formerly fed the silage ration made an average daily gain of 1.03 lbs. per steer, and those formerly fed the shock corn an average gain of 1.2 lbs. Considering both of the tests the average daily gain of the silage lot was 1.249 lbs. and of the shock-corn lot 1.275 lbs.

"This does not indicate anything except that up to this time neither ration possessed a marked advantage for securing rapid gains on calves and yearlings up to the beginning of the finishing period. . . . The silage-fed steers have apparently larger frames, and largely on this account do not appear to carry as much flesh as the shock-corn-fed steers."

Feeds supplementary to corn for fattening steers, H. W. Mumford (*Illinois Sta. Bul. 83, pp. 541-576*).—The value of a corn ration supplemented by gluten meal and by clover hay was studied, the former feed being chosen because it is a corn product and its use is consequently of importance to corn growers, and the latter because it is believed that the possibilities of nitrogenous coarse fodders are not generally recognized.

Three lots of common to medium quality steers were selected, lot 1 being fed corn and clover hay, lot 2 corn, timothy hay, and corn stover, and lot 3 the same feeding stuffs as lot 2 with gluten meal in addition. After a preliminary period of 3 weeks, the test proper began February 8, and covered 2 periods of 63 days each. During the first period unground corn was fed, and during the second corn-and-cob meal. At the beginning of the trial each lot contained 13 animals averaging 917 lbs. each in weight. As the trial progressed one was sold from each lot. The steers were fed in open yards, with sheds, at first coarse fodder ad libitum with 10 lbs. per head per day of grain, the amount being increased as the test progressed. At the conclusion of the trial the steers were slaughtered, the weight of the dressed carcass, organs, etc., being recorded.

The following table summarizes the results of the test as a whole:

Corn supplemented by other feeds for steers.

Feeding stuff	Nutritive ratio of the rations.	Average daily gain per steer.	Grain eaten per pound of gain.	Coarse fodder eaten per pound of gain.	Relation of live to dressed weight.
		Pounds.	*Pounds.*	*Pounds.*	*Per cent.*
Lot 1, corn and clover hay	1: 9.43	2.51	7.68	4.82	58.9
Lot 2, corn, timothy hay, and corn stover	1:13.03	1.858	9.87	5.88	57.2
Lot 3, corn, gluten meal, timothy hay, and corn stover	1: 9.42	2.268	7.44	5.14	57.7

During the first period of the test 7 pigs, averaging 130 lbs. each in weight, followed each lot of steers, the number selected being just sufficient to utilize all the undigested grain and make satisfactory gains without additional feeding. During the second period each lot was followed by 4 pigs averaging 136 lbs. in weight. The smaller number was selected because the corn-and-cob meal furnished less undigested residue than the unground grain.

Considering the test as a whole the pigs following the 3 lots gained 542, 482, and 422 lbs., respectively. Taking into account both the beef and pork produced the author calculates that the average profit per steer in the 3 lots was $13.16, $4.45, and $14.08. In his opinion the test emphasizes the importance of coarse fodder in steer feeding and indicates that clover hay may be advantageously used on account of the nitrogenous material it supplies, being especially valuable when a concentrated feed, such as gluten meal, is also used. Neither the ration of corn and nitrogenous coarse feed nor corn and nitrogenous concentrated feed was regarded as entirely satisfactory and it is believed "that some judicious combination of the two, yet to be determined, will be found more satisfactory and profitable than either.

"A ration of corn, timothy hay, and corn stover has little to recommend it for beef production. It is not favorable for the production of large, rapid, or economical gains; nor is the beef produced by the use of such a ration desirable. It requires 1.5 lbs. more grain and 0.7 lb. more roughage to produce each pound of gain where timothy hay supplemented corn than where clover hay was used.

"The corn and clover hay ration possessed the following advantages: [It is] available on Illinois farms; [it] produced large gains; considered either from the standpoint of total beef produced or the cost of such beef it was a large and economical producer; [and] the beneficial effects of the clover hay in the ration of lot 1 appeared to extend to the pigs, as not only were greater gains in live weight of pigs made in lot 1 than in the other lots, but also more economical gains."

In the author's opinion the slaughter test showed that a ration of corn and timothy had a tendency to produce a high percentage of internal fat without a relatively high percentage of dressed beef, thickness of flesh, or layer of surface fat, which are important items from a market standpoint.

"It is impossible to determine whether the corn and clover hay ration or the corn, gluten meal, timothy hay, and corn stover ration had the greater tendency to produce lean beef, or flesh as greater gain of the steers fed corn and clover hay would naturally be followed by thicker flesh provided their lean beef making tendencies were the same. It is evident, however, that both the corn and clover hay rations and the corn, gluten meal, timothy hay, and corn stover ration had an advantage over the corn, timothy hay, and corn stover ration in this respect.

"It appears that the ration, where gluten meal is the conspicuous nitrogenous factor, has the ability to produce the finish demanded by the market with the least expenditure of both quantity and cost of food stuffs of any ration used in this experiment. The fact that there was more profit to the producer in the use of the ration containing gluten meal, notwithstanding the somewhat expensive nitrogenous concentrate used, is due to the combined facts of its being an equally effective ration as corn and clover hay to the securing of better finish without the necessity of putting on the maximum amount of unprofitable gains in live weight, and to the current prices of corn, gluten meal, and clover hay.

"The value of the manure made by the steers in lot 1 would be much more valuable per ton than that made by either of the other lots."

The author also calls attention to the fact that the condition of the feed lots is an important factor both as regards the extent and economy of the gains made. Thus, when the feed lots were dry and there was little variation in the weather gains were much more satisfactory than when the lots were muddy and the variations in temperature and humidity were great and sudden.

Live stock investigations, H. W. MUMFORD (*Illinois Sta. Circ. 65, pp. 29, figs. 2*). The live stock investigations at the station are discussed and experiments previously noted (E. S. R., 14, pp. 381) and those reported above are summarized.

"Cremaval" as a supplement to skim milk in feeding calves, C. MOSER and J. KÄPPELI (*Ann. Agr. Suisse, 3 (1902), No. 8, pp. 315–326, figs 2*).—As was the case with earlier tests[a] Cremaval, a commercial substitute for natural milk fat, did not give favorable results with calves. In the investigation now reported whole milk had a feeding value of 2.91 cts. per liter, and the Cremaval ration 3.55 cts.

Sheep breeding, R. DOYLE (*Transvaal Agr. Jour., 1 (1902), No. 1, pp. 42, 43*).—The subject is discussed with special reference to local conditions.

Economy of roots in sheep feeding, J. A. VOELCKER (*Jour. Roy. Agr. Soc. England, 63 (1902), pp. 338–376*).—Using 4 lots of 10 sheep each, the value of roots was studied. Lot 1 was given a full ration of roots and lot 2 a limited ration of roots, with linseed cake and clover hay in both cases. Lot 3 was also given a limited supply of roots and was fed linseed cake and chopped gorse in addition. Lot 4 received no roots, but was fed linseed cake and hay moistened with cane-sugar molasses mixed with water. The roots used were Swedish turnips and later kohl-rabi. The test covered from 87 to 108 days, the different lots being sold as soon as they seemed ready for market. At the beginning of the trial the average weight of the sheep was practically 117 lbs. per head. The gain ranged from 26.5 lbs. with lot 4, receiving no roots, to 43.2 lbs. with lot 1, fed a full supply of roots. The feeding period was the longest with the former lot and shortest with the latter.

According to the author, "feeding sheep on a limited supply of roots will not fatten them as well or as quickly as giving them a more liberal supply of roots. Feeding sheep on the land without any roots, and making up for the deficiency by giving extra hay, with treacle and water, will result in considerable financial loss, and feeding with gorse in partial replacement of hay will give good mutton, but no economical advantage over hay."

Sugar beet as food for sheep (*Jour. Bd. Agr. [London], 9 (1902), No. 2, pp. 225, 226*). A test carried on at the Southeastern Agricultural College at Wye in 1900, with 2 lots of 12 sheep each and covering 12 weeks, showed that when they were fed mangels in addition to a grain ration (corn, oats, and linseed cake) there was an average daily gain of 40.5 lbs. per sheep as compared with 33 lbs. when sugar beets were fed with the same grain ration. The sugar beets eaten were grown on 0.909 acre and the mangel-wurzels on an acre. The cost of growing the latter was less than the former.

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[a] Ann. Agr. Suisse, 3 (1902), No. 3, pp. 59–70.

The test was repeated in 1901 with 2 lots of 16 sheep each, fed respectively mangel-wurzels and sugar beets in addition to 1 lb. per head per day of oats, maize, and linseed cake. In the 8 weeks of the test the sheep fed mangel-wurzels made an average gain of 30 lbs. each, and those fed sugar beets of 22 lbs. "Moreover, the sheep which had received mangolds handled better, and their wool looked brighter than in the case of those receiving sugar beet. These results were, therefore, even more unfavorable to sugar beet than those obtained in the trials of the preceding year."

Angora goats in Australia (*Queensland Agr. Jour., 12 (1903), No. 2, pp. 113–116, pl. 1*).—The possibilities of Angora goat raising under local conditions are discussed, as well as the importation of goats and goat management.

On the growth of suckling pigs fed on a diet of skimmed cow's milk, MARGARET B. WILSON (*Amer. Jour. Physiol., 8 (1902), No. 3, pp. 197–212*).—In continuation of previous work by L. C. Sanford and G. Lusk, which is noted in detail, the author tested the comparative feeding value of skim milk with and without the addition of dextrose and lactose. Six new-born pigs of the same litter were obtained. Three were slaughtered and analyzed, and each of the rations tested was fed to one of the 3 remaining pigs. In the 16 days of the test the pig fed skim milk made a total gain of 883 gm.; that fed skim milk with 30 gm. of lactose hydrate per liter gained 1,140 gm., and the pig fed skim milk with the same amount of dextrose gained 986 gm. At the close of the test the pigs were slaughtered and analyzed. Below is the author's summary of this test and the earlier one referred to above:

"Skimmed cow's milk, with or without 2 to 3 per cent of added lactose or dextrose, is normally absorbed by suckling pigs. Two pigs fed on skim milk from 14 to 16 days gained 26.4 and 66.8 per cent in weight. Two pigs fed on the same skim milk, with 2 and 3 per cent of lactose added, gained 79.7 and 88 per cent in weight. Two pigs fed on the same skim milk, with 2 and 3 per cent dextrose added, gained 73.6 and 64.4 per cent in weight.

"Those fed with plain skim milk gained 114 and 218 gm. in weight for every 1,000 physiologically available calories in the food. The lactose pigs gained 222 and 215 gm. per 1,000 calories in the food. The dextrose pigs both gained 213 gm. per 1,000 calories in the food. Except in the case of one ill-nourished skim-milk pig, the growths of the sucklings stand in a constant ratio to the calories in the food.

"The pigs fed on plain skim milk used 23 and 35 per cent of the proteid in the food for tissue growth, the lactose pigs used 38 and 44 per cent, and the dextrose pigs 48 and 42 per cent. All the pigs of the second litter gained in fat when fed on plain skim milk or on skim milk with sugars.

"The percentage of calcium in the bodies of the pigs diminished with their growth. There was considerable and normal deposition of calcium in the pig, and this was proportional not to the calcium in the food, but to the growth of the animal. Not only is the growth in grams of the pigs proportional to the calories in the food, but the number of calories retained in the tissue substance during growth is proportional to the calories in the food. Eighteen to 19 per cent of the calories in the food were found stored in the tissue growth of the pigs fed on the 3 varieties of skimmed milk.

"There seems to be striking evidence that the suckling pig reared on skimmed cow's milk conforms to the same laws of nutrition as the breast-fed infant."

Measures for increasing pig raising, O. KNISPEL (*Arb. Deut. Landw. Gesell., 1903, No. 77, pp. 135*).—The author describes the methods followed in different German States to encourage pig raising. He mentions the work undertaken by breeding societies, offering of prizes, vaccination of pigs, and related topics.

The management of swine, L. Price (*Queensland Agr. Jour., 12 (1903), No. 1, pp. 34-36*).—On the basis of his own experience the author discusses the subject with reference to local conditions.

Molasses as a food for horses, G. H. Berns (*Amer. Vet. Rev., 26 (1902), No. 7, pp. 615-623*).—In addition to discussing some of the recent experiments on the value of molasses as a food for horses, the author reports several tests with a ration containing this material. Two horses weighing respectively 900 and 940 lbs. gained, in 6 weeks, 175 and 146 lbs., respectively, when fed 3 times a day 1 qt. of molasses (diluted with 3 qts. of water) mixed with 5 lbs. of cut hay. No long hay was fed in addition. They were given all the water they desired, but had no exercise. At the close of the test it is stated the animals were markedly improved in condition and "did their work well, in spite of the fact that they had not been exercised in 6 weeks."

A molasses ration was then fed for 14 months to 100 heavy truck horses, averaging 1,700 lbs. in weight, working 10 hours a day drawing very heavy loads, usually at a walk. They were fed per head morning and night 1 qt. of molasses diluted with 3 qts. of water, and thoroughly mixed with 6 lbs. of cut hay of good quality, 1.5 qts. corn meal, and 2.5 qts. of coarse bran, and in addition 5 qts. of dry oats in the middle of the day and 11 lbs. of long hay at night. It is stated that the animals gradually improved in condition and gained in weight, their coats becoming slick and glossy, while at the same time as much work was performed as before the test began. The general health of the horses was said to be excellent, cases of acute indigestion or spasmodic colic being rare, although formerly such attacks were of frequent occurrence.

Brief notes are also given regarding the successful feeding of a similar molasses ration to a number of other horses, of which 5 were driving horses. The author's summary follows:

"Molasses of a good quality is a most nutritious food for horses, easily digested and assimilated, and will in many cases correct faulty digestive processes. One quart of molasses at a cost of 3 cts. will take the place of from 3 to 4 qts. of good quality oats at a cost of from 4.5 to 6 cts.

"A sudden change from dry oats to molasses mixed with other food stuffs is perfectly safe and causes no disturbances of the digestive organs. Molasses-fed horses will do fully as much work and at the same time remain as a rule in much better general condition than animals fed on dry food, while the cost of feeding is reduced from 25 to 33 per cent."

Feeding experiments with horses: "Pail-mel" and maize, L. Grandeau (*Jour. Agr. Prat., n. ser., 5 (1903), No. 7, pp. 208-210*).—A test with 3 horses is reported in which a molasses feed called "Pail-mel," which is a mixture of straw and molasses, was used. The amount of work done was measured by a dynamometer.

Nutritive value of "Pail-mel," a molasses feed, L. Grandeau (*Jour. Agr. Prat., n. ser., 5 (1903), No. 6, pp. 177-179*).—The author reports the coefficients of digestibility of the rations fed when the horses were at rest, walking, and working. Data are also recorded regarding the amount of water consumed. The amount of molasses eaten varied from about 2.5 to 3.5 kg. per day. The animals all gained in weight, and the results as a whole are regarded as favorable to molasses feeding.

Handbook of horse raising, L. Born and H. Möller (*Handbuch der Pferdekunde. Berlin: Paul Parey, 1902, pp; VIII , 468, figs. 211*).—This is the fifth revised edition of this volume, which is designed as a handbook for army officers and agriculturists. It treats especially of the anatomy and physiology of the horse, points, diseases, training, shoeing, and feeding.

Horse raising in the Rhine countries in the light of statistics, Oldenburg (*Landw. Jahrb., 31 (1902), No. 5-6, pp. 791-821, maps 3*).—Horse raising in relation to agriculture is discussed on the basis of statistical data.

Poultry division report, D. D. Hyde (*New Zealand Dept. Agr. Rpt. 1902, pp. 127-134, pls. 4, figs. 2*).—Brief statements are made regarding the poultry at the different New Zealand experiment stations. The export trade in poultry and eggs, especially with England and South Africa, is discussed at some length.

Profitable poultry farming, F. C. Hare (*Canada Dept. Agr. Comr's Branch, Poultry Division Bul. 6, n. ser., 1902, pp. 47, figs. 37*).—Poultry raising, dressing, marketing, poultry diseases, and other subjects relating to the poultry and egg trade are discussed.

Experiments in artificial incubation (*Queensland Agr. Jour., 12 (1903) No. 2, pp. 117, 118*).—The tests reported show the need of moisture in the air of incubators and the desirability of adding it if removed too rapidly.

"The fatal effect of a rapid evaporation is to be found in the drying of the inclosing membrane of the eggs, or, in other words, the membrane covering the ovum becomes too dry to take up enough oxygen to suffice for the development and vital activity of the embryo, for while most animal membranes allow the exchange of carbon dioxid and oxygen to be effected with perfect ease, offering no serious impediment to the passage of either gas, dry membranes are impermeable to gases. Although the drying of the covering membranes often cuts short the development of the embryo, and the germs die at different stages of incubation, this most frequently takes place from the above cause from the seventeenth day to the end of the term, the greatest number dying about the eighteenth or nineteenth day."

The spoiling of hens' eggs preserved in wood ashes, H. Svoboda (*Oesterr. Chem. Ztg., 5 (1902), No. 21, pp. 483, 484*).—From experimental data the conclusion is drawn that wood ashes are not satisfactory for preserving eggs. It was found that when eggs were thus preserved the ash content was increased. An analysis of the ash of such eggs is reported.

The history of geese, J. J. McCue (*Queensland Agr. Jour., 12 (1903), No. 1, pp. 40-43*).—In this article, which is quoted from *Station, Farm, and Dairy*, the author describes the principal breeds of geese, including the black and white goose and the cereopsis goose, which are Australian varieties.

Ducks, G. Rogeron (*Les canards. Paris: J. B. Baillière & Son, 1903, pp. VIII+, 435, pl. 1*).—Different sorts of wild and domestic ducks are treated of, as well as the general subject of duck raising.

DAIRY FARMING—DAIRYING.

Feeding trials with cows, J. L. Hills (*Vermont Sta. Rpt. 1902, pp. 273-318+XXXVIII*).—This is the fifth year in which feeding experiments have been conducted along the same general line. Tests to compare low, medium, and heavy grain rations, to determine the feeding value of apple-pomace silage, and to ascertain the extent of experimental error in feeding trials made in previous years were repeated, and new trials were conducted to study the feeding value of malt sprouts, dried brewers' grains, and gluten meals of high and low protein content. The work is reported in detail and summarized, and an appendix contains the tabulated data. The trials covered a period of 24 weeks and included 50 cows. Each trial lasted 28 days, the conclusions in every case being based upon the results obtained during the last 18 days.

A comparison of 4, 8, and 12 lbs. of grain was made with 26 cows, with results essentially the same as previously obtained (E. S. R., 14, p. 78). An increase in the grain ration increased the yield of milk and butter, but not in proportion to the amount of grain fed. Changing from a low to a medium grain ration increased the yield of milk 9 to 13 per cent, and changing from a medium to a high grain ration did not increase the yield over 3 per cent. The quality of the milk was not materially affected. The dry matter in the low grain ration made proportionately more milk and butter than the dry matter in the medium ration, and the same was true when the medium ration was compared with the heavy ration. The weights of about two-thirds of the cows increased or decreased as the amount of grain fed was increased or decreased. From a financial standpoint the results for 3 years were unfavorable to the high grain ration. For continuous dairy feeding the author favors a medium grain ration, 4 lbs. being considered lower than is advisable with cows of the better class.

Four cows were used in comparative tests of malt sprouts with (1) cotton-seed meal, linseed meal, and bran, and (2) oats and bran. As compared with mixture No. 1, malt sprouts decreased the yield of milk 10 per cent, but did not affect the quality of the milk nor the yield in relation to the amount of dry matter consumed. The use of malt sprouts was less economical. As compared with mixture No. 2, malt sprouts decreased the yield of milk 4 percent, the quality remaining unchanged. The dry matter consumed was 9 per cent less, making the yield in proportion to the dry matter 5 per cent greater than when oats were fed. The malt sprouts were not readily eaten by the cows in either experiment.

The relative feeding value of dried brewers' grains and a mixture of cotton-seed meal and linseed meal was tested with 1 cow. There was no marked difference in the yield and quality of milk. The use of brewers' grains was the more economical.

Gluten meals containing, respectively, 29.2 and 36.7 per cent of protein were compared with 4 cows, the results showing practically no difference as regards the yield and quality of milk and the amount of dry matter consumed.

A third trial of apple pomace was made with 12 cows. As much milk and 3 per cent more butter was produced on apple pomace as on corn silage. The yield per unit of dry matter was 7 per cent greater in the case of the pomace ration. No unfavorable effects were observed. A ton of apple pomace is considered as having practically the same feeding value as a ton of silage.

Additional data concerning the experimental error involved in feeding trials served to confirm the view already advanced that if 2 or 3 animals are used the experimental error inherent in the alternation method may be quite disregarded.

A comparison of feeding trial methods, J. L. HILLS (*Vermont Sta. Rpt. 1902, pp. 318–327*).—In earlier experiments (E. S. R., 14, p. 79) two methods of feeding were compared, one in which different rations were fed to the same group of animals during alternate periods, and one in which the animals were divided into 2 groups, one group being fed continously on one ration and the other group alternately on different rations. While the results of the previous work seemed to show but little difference in the two methods, the present trials, made on a more extensive scale, favor the plain alternation system. The work is to be continued in the hope of arriving at more definite and satisfactory results.

Records of the station herd for 1900–1 and for 1901–2, J. L. HILLS (*Vermont Sta. Rpt. 1902, pp. 327–342*).—These records are similar in character to those previously reported (E. S. R., 13, p. 586). The average results for the 2 years are respectively as follows: Number of cows 47 and 49, yield of milk 5,814 and 5,166 lbs., fat content of milk 5.07 and 5.03 per cent, yield of butter 344 and 308 lbs., cost of food $49.97 and $49.13, and proceeds from sales of butter $94.56 and $85.33.

A comparison of score card judgments and of milk and butter records, J. L. HILLS (*Vermont Sta. Rpt. 1902, pp. 342–344*).—The station herd and 2 private herds were scored, the results being compared afterwards with the milk and butter records of the cows. The work was done by R. R. Strait, under the author's directions. In all 62 records were used in the comparison. The results seem to show that in the long run cows scoring high were but little if any superior as milk and butter producers. On the other hand, a relationship between lack of conformation to dairy types and lessened production was considered as plainly established.

The effect of feed on the quality of butter, J. L. HILLS (*Vermont Sta. Rpt. 1902, pp. 345, 346*).—In connection with the feeding experiments noted above and in continuation of previous work (E. S. R., 14, p. 79), 43 samples of butter, representing 191 churnings, were analyzed to determine the effect of different feeding stuffs upon the quality of the butter. As shown by analysis, apple pomace, corn silage, and dried brewers' grains had no effect upon the quality of the butter. Malt sprouts and ground oats, especially the latter, decreased the iodin number. Germ oil meal increased the iodin number. The gluten meals tended to produce soft butter. The content of volatile fatty acids was increased and the melting point and iodin numbers were reduced. As measured by inspection, the only bad effects on the quality of the butters were observed for a short period when malt sprouts were fed.

The change from barn to pasture, J. L. Hills (*Vermont Sta. Rpt. 1902, pp. 346–350*).—Records of the station herd for 8 years as regards the yield and quality of milk for the 2 weeks preceding and the 6 weeks following a change from barn to pasture are discussed. During 4 years a majority of the cows showed a tendency toward immediate and decided improvement, followed by a return to the original quality. There was one year in the majority of cases a slow tendency toward improvement. During 3 years the quality of the milk of the majority of the cows remained practically unchanged. Reasons for the facts observed are not advanced. It is considered clearly established that no poorer milk results from pasture feeding even when the flow is considerably increased.

Dairy conditions and suggestions for their improvement, W. J. Fraser (*Illinois Sta. Bul. 84, pp. 577–631, figs. 46*).—The dairy conditions in the State have been under investigation by the station during the past 6 years. In some particulars the conditions are considered ideal, while in others they are far below the proper standard. This bulletin aims to suggest remedies for the faults most commonly found in actual practice. Some of the subjects discussed are the location and construction of barns and stables, care of yards, cleanliness in milking, care of milk and dairy utensils, feeding cows, construction and management of creameries, and markets for dairy products, numerous practical suggestions being made in each case.

Experiments to compare the amount of dirt falling from washed and unwashed udders during the process of milking are reported as follows: "It was determined after several trials with 3 different milkers on 30 cows that it requires an average of 4½ minutes to milk a cow. A glazed dish 11 in. in diameter, the size of an ordinary milk pail, was placed in the top of a pail and held under a cow's udder in the same position as when milking. For 4½ minutes the milker then went through motions similar to those made in milking, but without drawing any milk. The amount of dirt which fell into the dish during the operation was, of course, approximately the same as would have gone into the milk during the milking process. The dirt caught in the dish was then brushed into a small glass weighing tube, the udder washed, and the process repeated. The dirt which fell from the washed udder was also carefully brushed into a weighing tube. Both tubes were then placed in a desiccator, and after drying 24 hours were accurately weighed on a chemical balance. Sixty trials were made at different seasons of the year. With udders that were apparently clean it was found that an average of 3½ times as much dirt fell from the unwashed udders as from the same udders after they were washed. With soiled udders the average was 22 and with muddy udders the average was 94 times as much dirt from the unwashed udders as from the same udders after washing."

Dairy investigations, W. J. Fraser (*Illinois Sta. Circ. 63, pp. 7*).—This is a report of progress on the dairy work which has been carried on by the station for nearly 2 years under State appropriations.

Variations in the composition of cows' milk, H. Ingle (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 15 (1903), pp. 135–182, figs. 12*).—The author summarizes the results of his earlier investigations relating to the composition of milk (E. S. R., 14, p. 80) and reports further work, the main objects of which were to ascertain the effect of unequal intervals between milkings upon the composition of the milk, and to discover a means of diminishing the difference in fat content between morning and evening milk when the intervals are unequal. Incidentally separate analyses were made of the milk yielded by each quarter of the cow's udder.

Five cows were milked at 6 a. m. and 3 p. m. during a period of 2 weeks. The average fat content of the morning milk was 2.87 per cent, and of the evening milk 4.26 per cent, the ratio between the two being 1:1.484. During the 4 weeks following the same cows were milked at 5.30 a. m. and 5 p. m. The fat content of the morning and evening milk was, respectively, 3.18 and 3.80 per cent, the ratio being 1:1.195. During a third period of 3 weeks with the hours of milking the same as in the first period the percentages of fat in the morning and evening milk were, respectively, 2.94 and 4.40, the ratio being 1:1.497. The results confirm the generally accepted conclusion that the low fat content of morning milk as compared with evening milk is due to unequal intervals between milkings. Following a change from unequal to approximately equal intervals the difference in percentages of fat gradually lessened.

The attempt was made to improve the quality of the morning milk by methods of feeding, the intervals between milkings remaining unequal. Cows on pasture were fed a grain mixture consisting of equal parts of cotton-seed meal and corn meal, one group receiving 3 lbs. morning and evening, one group 6 lbs. in the morning only, and one group 6 lbs. in the evening only. The different methods of feeding did not alter very much the relative yield of milk morning and evening. When the grain was fed only in the morning the fat content of the morning milk was increased, from which it would seem that where circumstances necessitate unequal intervals this plan of feeding would lessen the danger of the morning milk being below the standard.

The milk from each quarter of the udders of 2 cows was collected separately for 6 days and analyzed. The fat content showed no constant variations. In both cases, however, the milk from the left fore quarter was much smaller in quantity and lower in solids-not-fat than that from the other quarters. These results led to tests of the herd of 19 cows, the average results of which are given in the following table:

Yield and quality of milk from different quarters of the udder.

	Yield of milk.	Fat content.	Solids-not-fat.
	Pounds.	*Per cent.*	*Per cent.*
Right fore quarter	2.42	3.86	8.78
Right hind quarter	2.47	3.96	8.63
Left fore quarter	1.85	3.84	8.45
Left hind quarter	2.50	3.85	8.71

"The variation in fat in milk from different quarters of the udder is perhaps not surprising when we remember that the fat is apparently produced by the breaking down of fat cells in the gland itself; but that different glands, or different parts of the same gland, should be able to elaborate, from the same blood supply, products of different concentration in dissolved matter, appears to the writer to be very remarkable. The results should certainly prove of interest to the physiologist, though they perhaps have little practical importance from a dairy point of view."

Ayrshire herd tests, F. W. Morse (*New Hampshire Sta. Bul. 96, pp. 117–121*).—Tests of Ayrshire cows have been conducted by the station since 1894, some of the data being given in tabular form. The tests made during 1901 and 1902 show a range in the percentages of fat from 3.48 to 4.40, with an average of 3.88 per cent, and a range in the total solids from 11.71 to 13.27, with an average of 12.55 per cent. The author concludes that some of the herds are developing the quantity of milk at the expense of quality. Of 21 cows tested during the year, 15 gave the maximum fat test in the first month, and 13 the maximum yield of milk in the second month.

The milk supply of London, M. Beau (*Jour. Agr. Prat., n. ser., 5 (1903), No. 17, pp. 535–537*).—A brief general description of the milk supply of London.

Diminution of the content of lecithin in heated milk, Bordas and Raczkowski (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 1, pp. 56, 57*). As compared with the quantity in raw milk, the percentage of lecithin was reduced 14 per cent by heating for 30 minutes at 60° C., 28 per cent by heating over a flame for 30 minutes at 95°, 12 per cent by heating over a water bath for 30 minutes at 95°, and 30 per cent by heating in an autoclave for 30 minutes at 105 to 110°.

The water content of creamery butter, H. E. Alvord (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 39, pp. 4*).—Previously noted from another source (E. S. R., 14, p. 523).

The relation of carbon dioxid to proteolysis in the ripening of Cheddar cheese, L. L. Van Slyke and E. B. Hart (*New York State Sta. Bul. 231, pp. 21–41*).—The investigations reported in this bulletin are summarized by the authors as follows:

"(1) The object of the work described in this bulletin was to ascertain the extent to which carbon dioxid is formed in American Chedder cheese during long periods of time in the process of ripening, and also to learn the nature of the chemical changes that give rise to the production of this gas.

"(2) Two cheeses were used for this study. One was entirely normal; the other was made from milk containing chloroform and kept under antiseptic conditions. The investigation was continued 32 weeks, when a chemical study was made of the proteolytic end-products.

"(3) In the normal cheese, carbon dioxid was given off continuously, though in decreasing quantities after about 20 weeks, and had not ceased at the end of 32 weeks. The total amount thus produced was 15.099 gm., equal to 0.5 per cent of the fresh cheese. In the chloroformed cheese, the total amount of carbon dioxid produced was 0.205 gm., practically none being found after 3 weeks.

"(4) In the normal cheese, the following end-products of proteolysis were found: Tyrosin, oxyphenylethylamin, arginin in traces, histidin, lysin, guanidin, putrescin in traces, and ammonia. In the chloroformed cheese were found the same compounds, except oxyphenylethylamin, guanidin, putrescin, and ammonia; but arginin was found in marked quantities for the first time in cheese.

"(5) A consideration of the possible sources of carbon dioxid in the 2 cheeses indicates that in the case of the chloroformed cheese the carbon dioxid came from that present originally in the milk and that formed in the milk from the decomposition of milk-sugar before treatment with chloroform. In the case of the normal cheese, the carbon dioxid given off in its early age came largely from the decomposition of milk-sugar by lactic-acid organisms, while a small amount was probably due to the carbon dioxid present in the milk and to the respiration of living organisms present in the cheese. The carbon dioxid produced after the first few weeks came apparently from reactions taking place in some of the amido compounds, among which we were able to identify the change of tyrosin and arginin into derived products with simultaneous formation of carbon dioxid.

"(6) In the chloroformed cheese, the only active proteolytic agents were lactic acid, galactase, and rennet-pepsin. Under the conditions of our experiment, these agents were able to form neither ammonia nor secondary amido compounds with production of carbon dioxid. The presence of chloroform could not account for this lack of action. These results suggest that in the normal cheese there must have been some agent at work not present in the chloroformed cheese and that this extra factor was of a biological character."

Rusty spot and a remedy, F. H. Hall, H. A. Harding, and G. A. Smith (*New York State Sta. Bul. 225, popular ed., pp. 7*).—A popular summary of Bulletin 225 of the station (E. S. R., 14, p. 908).

Report of the seventeenth annual meeting of the Granite State Dairymen's Association, 1901 (*Granite State Dairymen's Assoc. Rpt., 17 (1901), pp.*

77).—This report includes the following addresses: Dairying in France, by H. E. Alvord; Creamery and Dairy Practice, by G. A. Smith; Some Points of the Dairy and its Adjuncts, by F. L. Davis; and New Hampshire Dairy Products at the Pan-American Exposition, by W. D. Baker.

Officials, associations, and educational institutions connected with the dairy interests of the United States for the year 1903 (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 40, pp. 11*).

VETERINARY SCIENCE AND PRACTICE.

The first Norwegian veterinary meeting (*Maanedsskr. Dyrlæger, 14 (1902), Nos. 6, pp. 253–303; 7, pp. 313–394; 8, pp. 403–469; 9, pp. 481–520*).—Among the large number of papers read at this meeting brief notes may be given on the following:

Combating bovine tuberculosis, J. Fibiger (pp. 253–255).—The author's experiments indicate that tubercle bacilli obtained from a young child were highly virulent for calves, and that therefore the disease as observed in man and animals can not be considered essentially different.

The work of combating bovine tuberculosis in Norway, Malm (pp. 259–274).—This work is said to have begun in 1891 and has since been prosecuted actively, with the aid of government appropriation. Tables are presented showing the number of localities in which infected herds are found, the breed of animals affected, and the percentages of tuberculous cattle as shown by tuberculin tests.

Combating tuberculosis in Sweden, G. Regnér (pp. 274–286).—Detailed notes are given on the temperature reactions in 250,321 cattle tested with tuberculin during the years 1897–1901, and other tables are given showing the percentages of infected animals in different herds.

The control of food materials with special regard to preservatives for meat, A. Jacobsen (pp. 313–346).—Notes are given on the etiology of cases of meat poisoning which have been found to be due largely to the presence in meat of *Bacillus coli communis*, *B. enteritidis*, *B. morbificans bovis*, and *B. proteus vulgaris*. Special attention is given to the effect of various preservatives upon these bacteria and upon the keeping quality of meat, as well as upon the health of human beings.

Castration of Cryptorchids, F. Winter (pp. 358–388).—The literature of this subject is briefly reviewed and detailed descriptive notes are given on the various methods which have been devised and successfully used by various veterinary surgeons in performing this operation.

Results obtained by neurectomy, especially in cases of spavin, L. Morkeberg (pp. 403–433).—Detailed descriptions are given of a large number of cases in which neurectomy was performed for the cure or relief of spavin. In many cases double neurectomy is required, but according to the author's experience this method may be depended upon to bring about the desired results in about 70 per cent of cases.

Artificial insemination in mares, Sand (pp. 481–489).—The author believes that this operation may be resorted to with good results and may prove an important economic device under certain circumstances connected with the breeding of horses.

Aspergillosis in animals artificially fed upon milk, von Hellens (pp. 512–520).—A number of cases of this disease were observed by the author, especially in colts. The pathological anatomy of the disease sometimes gives rise to confusion with tuberculosis, and notes are given on the means of making a reliable differential diagnosis.

Report of chief veterinary inspector, J. G. Rutherford (*Rpt. Min. Agr. Canada, 1902, pp. 71–152*).—This report includes, besides a general account of the health of animals by the chief inspector, a large number of reports of veterinary inspectors in various parts of the Dominion of Canada. The majority of outbreaks of hog cholera reported were apparently due to the importation of hogs from infected parts of Ontario or from the United States. · During the year 1,277 cattle were tested with tuberculin for export into the United States. Of this number 72 reacted. Very little testing of dairy cattle was done during the season. Experiments to determine the period which elapses between actual infection and the time when tuberculin produces a reaction indicate that this period varies from 8 to 50 days. It is recommended that so long as an animal does not show pronounced signs of generalized tuberculosis its progeny should be reared. A number of cases of glanders are reported. The author believes that a large percentage of glanderous horses ultimately recover without treatment. It is also suggested that horses which cease to react to mallein are no longer infectious.

Further studies were made on the Pictou cattle disease. This is a cirrhosis of the liver. Nothing definite has been learned regarding its cause. A report by W. H. Pethick contains a description of the conditions which actually prevail in the region where this disease is observed. It is stated that cattle raisers usually consider this disease as due to feeding upon ragwort (*Senecio jacobæus*). Actinomycosis is said not to be so frequent as in former years. A few cases of anthrax were observed, but the infected area was closely quarantined and the ground subsequently burned over twice. Blackleg prevailed to considerable extent in the Northwest Territories and Manitoba. Verminous broncho-pneumonia appears to be on the increase among hogs in Ontario, especially where these animals are kept under unfavorable hygienic conditions. Brief notes are given on mange in cattle and horses, and on sheep scab.

Swamp fever in horses has prevailed in Red River Valley for a number of years, with very fatal results. This disease was investigated by the author and also by F. Torrance. The symptoms and the course and lesions of the disease are described in detail. It was shown that the disease is not surra. An organism was isolated which occurs more frequently than any other in cases of swamp fever, but inoculation experiments have thus far failed to demonstrate definitely its causal connection with the disease. A number of experiments were made on guinea pigs by C. H. Higgins to determine whether electric currents of high frequency exert any curative influence in cases of tuberculosis. The guinea pigs were inoculated with material obtained from a tuberculous steer. The treatment consisted in exposing the animals for 10 minutes daily to the effects of electric currents. After a few days' treatment the exposure was increased to 20 minutes per day. Detailed notes are given on the progress and duration of the disease in different animals. It was found as a result of these experiments that electric currents of high frequency exert a beneficial influence in assisting animals to overcome the action of tubercle bacillus. The average life of treated animals was 42.4 days, while that of untreated animals was 28.5.

Report of the city veterinarian, W. W. Richards (*War Dept., Bureau of Insular Affairs, Philippine Com. Rpt. 1902, pt. 1, pp. 380–383*).—The author presents brief statistical notes on the numbers of domestic animals shipped into the Philippines from different countries. A brief discussion is also given on the diseases which have been observed among animals. The bladder worm was found quite extensively in hogs slaughtered at the public abattoir in Manila. Among 1,500 horses inspected 40 were found affected with glanders and all were killed. The public abattoir in Manila is under the supervision of a native inspector and from the notes kept concerning the numbers and conditions of animals slaughtered at this abattoir brief statistics are presented giving the number of condemned animals and causes of condemnation.

Work of the biological laboratory, D. C. Worcester (*War Dept., Bureau of Insular Affairs, Philippine Com. Rpt. 1902, pt. 1, pp. 293, 294*).—Brief notes on the work of this laboratory, which has been occupied largely in the preparation of sera for the detection and treatment of Asiatic cholera, surra, glanders, hog cholera, etc.

A large number of examinations were made of pathological tissue sent in from various localities. Considerable work has been done in the preparation of cultures of locust fungus to be distributed throughout the different provinces.

Bacterial diseases of animals, E. THIERRY (*Jour. Agr. Prat., n. ser., 5 (1903), No. 3, pp. 77–79*).—Brief notes are given on the etiology of different classes of infectious diseases of animals.

Microbes and diseases of farm stock, J. DUNSTAN (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 15 (1903), pp. 1–32, pls. 8*).—The objects of this article are to describe the essential features of bacteriology as applied to diseases, to draw attention to some of the most prevalent diseases of farm animals, and to indicate methods for dealing with them. Notes are presented on the biology of pathogenic microorganisms, and on immunity, disinfection, anthrax, tuberculosis, glanders, blackleg, hog cholera, tetanus, pneumonia, strangles, contagious mammitis, contagious abortion, white scours, arthritis, actinomycosis, rabies, septicemia, ringworm, etc.

The nursing of veterinary patients, H. A. WOODRUFF (*Agr. Student's Gaz., n. ser., 11 (1902), No. 2, pp. 43–48*).—Attention is called to the necessity of exercising special care in feeding and watering diseased animals in order to secure the best results from medicinal treatment.

Theories of immunity and their clinical application, A. S. GRUNBAUM (*British Med. Jour., 1903, Nos. 2203, pp. 653–655, fig. 1; 2204, pp. 715–720; 2205, pp. 783–786*).—These were the 3 Goulstonian lectures delivered by the author at the Royal College of Physicians, London. The author discusses the theories of Metchnikoff and Ehrlich and shows that while they are apparently antagonistic, they are founded upon essentially the same phenomena and are different interpretations of the same functions. The following matters belonging to the general subject of immunity are discussed: Antitoxins, hemolysins, cytotoxins, incubation of diseases, effects of protective inoculation and infection on immunity, relapses and reinfections, predisposition, susceptibility, serum diagnosis, and partial agglutinins.

The antitoxic power of the organism and tissues toward certain poisons, G. ANGELICI (*Gior. R. Soc. Accad. Vet. Ital., 51 (1902), Nos. 46, pp. 1145–1151; 47, pp. 1169–1171; 48, pp. 1202–1205; 50, pp. 1271–1277; 51, pp. 1295–1299; 52, pp. 1314–1317; 52 (1903), No. 1, pp. 12, 13*).—In the long series of experiments reported in this article the author tested the effect of certain poisonous substances, especially strychnin, upon the organism as a whole and upon the various tissues. Particular attention was given to the resisting power of the organism to poisons and to an investigation of the cause of this resistance. The experimental animals used by the author were chiefly guinea pigs and frogs, and the alkaloids with which most experiments were made were strychnin and nicotin. The alkaloids were injected hypodermically and intravenously. It was found that normal tissues may become somewhat edematous under the influence of strychnin when this is injected repeatedly. This alkaloid, however, spreads from the point of injection for considerable distances without undergoing any alteration. When fatal doses of strychnin are given in connection with olive oil in the form of an emulsion the poisonous effect of the strychnin is not produced. The same results were obtained from the use of phenol in frogs. The poisonous properties of calomel were similarly attenuated by mixing with olive oil. The author believes that the liver has the power of retaining and greatly altering alkaloids, especially strychnin, and this organ may be therefore considered as an important means of protecting the organism against the poisonous effects of strychnin. A brief bibliography of the subject is appended to the article.

Experimental study of inflammatory neomorphs in connective tissue, A. MAXIMOW (*Beitr. Path. Anat. u. Allg. Path., 32 (1902), Suppl. 5, pp. 262, pls. 13, fig. 1*).—The author undertook an elaborate investigation of the processes which are concerned in the formation of neomorphic structures in connective tissue as a result of inflammation. The experimental animals were rabbits, dogs, and pigeons, and the method of investigation consisted in the introduction of aseptic foreign bodies into the subcutaneous connective tissue. The histological processes which are observed in the formation of the new connective tissue are described in great detail. The elements which are most important in the formation of these new tissue are the polymorphous leucocytes, fibroblasts, and polyblasts. The fibroblasts are the ordinary connective tissue cells which existed before the inflammation set in. They begin to proliferate at a very early stage of the inflammation. The polyblasts are said to play an exceedingly important rôle in the formation of the new connective tissue. They are to be characterized as amœboid wandering cells with a single nucleus.

General histological technique with special reference to the possibility of a morphological demonstration of cellular narcosis, H. Zangger (*Vrtljschr. Naturf. Gesell. Zurich, 47 (1902), No. 1–2, pp. 42–72*).—Detailed notes are given on the technique of staining animal cells by various methods with special reference to methods intended to demonstrate the presence of narcosis in various animal tissues.

Vasogen preparations in veterinary practice, A. Höljer (*Deut. Tierärztl. Wchnschr., 10 (1902), Nos. 47, pp. 449–452; 48, pp. 455–457*).—The vasogen preparations which have already been placed on the market by a firm in Hamburg number 20 or more. The author made experiments with a number of these preparations, especially in the treatment of suppurative wounds. Iodoform, iodin, pyoctanin, creolin, camphor, chloroform, creosote, and ichthyol vasogen were used, as well as mercuric vasogen salve and vasogenum purum spissum. In the author's experiments with these materials it was found that a rapid penetration and absorption took place, and the effectiveness of the preparations in inducing the process of healing was very striking. No irritation appeared to be produced by these substances upon the skin and no toxic effect was observed, whether used internally or externally.

Silver therapy, Dorn (*Berlin. Thierärztl. Wchnschr., 1902, No. 27, pp. 403–405*).—Notes are given on the use of colloidal silver in the treatment of puerperal septicemia, contagious coryza, and morbus maculosus, together with a brief account of the nature and therapeutic use of protargol and itrol.

The present status of photo-therapy and its application in veterinary practice, I. I. Neimann (*Arch. Vet. Nauk, St. Petersburg, 32 (1902), No. 12, pp. 1017–1029*).—A critical review of the literature of this subject is presented in connection with a bibliography. The author believes that light may be used under various conditions in the treament of animal diseases, and suggests apparatus and arrangement of the same for convenient use in military veterinary hospitals and similar institutions.

Treatment of malignant edema with carbolic acid, with remarks upon "leeches," or bursattee, C. F. Dawson (*Jour. Comp. Med. and Vet. Arch., 23 (1902), pp. 301, 302*).—In an operation wound made for the purpose of removing a "leech" tumor, malignant edema developed. In treating the tumor for malignant edema, injections of strong carbolic acid were used, 1 dm. being injected daily for 3 days. The formation of gas within the tumor was checked and extensive suppuration occurred for some time, with recovery of the animal after 1 month.

Accidents following upon preventive inoculation and bacterial associations, V. Galtier (*Jour. Méd. Vét. et Zootech., 5. ser., 6 (1902), Dec., pp. 697–703*).—Brief notes are given on accidental infections which may be brought about during the performance of preventive inoculation. It is believed that the association of different bacteria may aggravate the effects of vaccination made with a benign virus so that more or less serious results may attend what would otherwise have been a harmless operation.

On the relationship of human tuberculosis to that of bovines, D. J. Hamilton (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 15 (1903), pp. 232–278, figs. 3*).—The author discusses the difficulties of determining the possibility of transmitting bovine tuberculosis to man, and also gives brief notes on the transmission of human tuberculosis to cattle, the problem of the unity of tubercle bacilli, the relative virulence of this organism, the criterion of infection, and Arloing's criticism of Koch's experiments.

The author's experiments were arranged in 4 series for the purpose of testing 4 methods of transmitting human tuberculosis to cattle. In the first series the animals were fed on tuberculous sputum; in the second series calves were inoculated with material from caseous cervical glands of human origin; in the third series similar experiments were made, and also experiments in the subcutaneous inoculation of tuberculous sputum, intravenous inoculation of the same, and inhalation of tuberculous sputum; in the fourth series experiments were made for the purpose of determining whether human tubercle bacilli gain in virulence by being transferred from one bovine to another.

The general conclusions drawn from these numerous experiments may be summarized as follows: Human tubercle bacilli, although not so virulent for calves as the bovine form, may nevertheless be successfully inoculated in cattle. This statement is true whether the material is derived from lymphatic glands, tuberculous lungs, sputum, or urine. Positive results in infection are obtained whether the material is introduced by way of the mouth, by subcutaneous inoculation, intravenous inoculation, or by respiring a spray containing bacilli. The lymphatic system is always involved in these cases of experimental tuberculosis, and in general the organs most affected are those nearest the point of inoculation. Tubercle bacilli of human origin when transferred to calves gain greatly in virulence by this process. The author believes, therefore, that his results favor the view that the bovine and human tubercle bacillus are identical, although somewhat differently modified by the difference in environment.

Transmission of human tuberculosis to cattle, C. O. Jensen (*Maanedsskr. Dyrlæger, 14* (*1902*), *No. 9, pp. 527–534*).—The author presents summary accounts of a number of experiments in which different authors have succeeded in transmitting human tuberculosis to cattle.

On the infectivity of the milk of tuberculous cows, the bacteriological diagnosis, and the practical value of tuberculin in the extirpation of tuberculosis among cattle, Lydia Rabinowitsch (*Jour. Comp. Path. and Ther., 15* (*1902*), *No. 3, pp. 209–215*).—This article is of a controversial nature and is largely occupied with a discussion of the importance of the milk from tuberculous cows as a factor in human tuberculosis. Since, in the experience of the author and many other investigators, tubercle bacilli are frequently found in the milk of tuberculous cows, it is urged that all means should be used for exterminating animals which may yield milk containing tubercle bacilli. This method includes the destruction of all animals suffering from mammary tuberculosis and a strict quarantine of animals in which a clinical diagnosis can be established only by the help of tuberculin. The time at which the latter class of animals should be killed will depend upon the rapidity of the course of tuberculosis.

Milk from tuberculous cows, J. M. Young (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 15* (*1903*), *pp. 212–216*).—During the experiments reported by the author 17 among about 60 cows reacted to the tuberculin test. Among this number 4 were found to exhibit tuberculosis of the udder. From numerous inoculation experiments with the milk of these cows it was found that milk from cows affected with tuberculosis of other organs than the mammary glands possessed no virulence and was not capable of producing tuberculosis when inoculated into guinea pigs. The milk from cows suffering from mammary tuberculosis, however, was in all instances virulent and produced the disease in guinea pigs.

Should the use of the meat and milk of tuberculous animals as food be absolutely prohibited? L. del Rio (*Vet. Españ., 45* (*1902*), *Nos. 1611, pp. 383–385;*

1612, pp. 401–404; 1613, pp. 414–416; 1614, pp. 429–431; 1615, pp. 447–449; 1616, pp. 465–467; 1617, pp. 479–481; 1618, pp. 495, 496; 1619, pp. 512–514; 1620, pp. 528–530).—The author reviews the work of the various investigators along this subject. Attention is called to the importance of meat and milk as human food and to the possible dangers to human health from the consumption of tuberculous products. Brief notes are given on the classification of meat in abattoirs according to its hygienic condition. The author believes that, as a result of these studies and experiments, tuberculosis of man and cattle are 2 forms of the same disease. Brief notes are also given on the distribution and statistics of tuberculosis.

The Public Health (Scotland) Act, 1897, and its relation to owners of stock, J. Henderson (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 15 (1903), pp. 63–69*).—Attention is called to the provisions of this law which relate to the sale of diseased animals and meat products. It is argued that in many instances the stock raiser may be unable to recognize the symptoms of disease and is not therefore criminally responsible for selling such animals for meat.

Cerebral tuberculosis, G. Nuvoletti (*Gior. R. Soc. Accad. Vet. Ital., 51 (1902), No. 37, pp. 921–924*).—The author describes the gross and microscopic features of tubercles obtained from the surface of the brain in cases of bovine tuberculosis.

Extracts of tubercle bacilli and other tuberculins other than those of Koch, L. Guinard (*Rev. Tuberculose, 9 (1902), No. 3, pp. 289–319*).—The author gives a detailed description of the methods used in obtaining extracts of tubercle bacilli and producing tuberculin as practiced by Hunter, Cheyne, Klebs, Hirschfelder, Weyl, Denys, Vesely, de Schweinitz, Maragliano, von Behring, Arloing, Guinard, and Auclair.

Variations in the virulence of different cultures of turbercle bacilli, D. Veszprémi (*Centbl. Bakt. u. Par., 1 Abt., 33 (1903), Nos. 3, Orig., pp. 176–184; 4, pp. 255–259*).—The purpose of the investigations reported in the present paper was to determine whether there is in general a variation in the virulence of different cultures of tubercle bacilli corresponding to the differences in malignity of various cases of tuberculosis among human beings.

In these experiments 8 cultures were used from different human cases of tuberculosis; and from each culture material was taken for inoculation of 2 or more rabbits in the auricular vein. The amount of material used was about 3 mg. for each rabbit. Details are given concerning the effects of these different cultures on the experimental animals. It was found that tubercle bacilli in pure cultures when injected in suitable quantities into animal organisms may produce toxins which operate unfavorably upon experimental animals. These toxins are of considerable influence upon the severity of the infection. It was found also during these experiments that tubercle bacilli may indicate spontaneous degeneration and that artificial cases of tuberculosis may finally result in recovery. The tubercle bacilli in fresh cultures from different cases of human tuberculosis, especially of the pulmonary form, showed decided differences in virulence. Cultures of tubercle bacilli kept for a considerable period upon artificial nutrient media were gradually attenuated or completely lost their virulence.

It is believed as a result of these experiments that tubercle bacilli from different cases of this disease possess essentially different degrees of virulence, which may account in part for the observed differences in virulence and rapidity of extension in different cases of tuberculosis.

Treatment of parturient paresis with iodid of potash, L. Misier (*Rec. Méd. Vét., 8. ser., 9 (1902), No. 11, pp. 342–345*).—Excellent results were obtained from the use of hypodermic and intramammary injections with iodid of potash. After the administration of this chemical the author recommends the use of a hypodermic injection containing benzoate of eserin and sulphate of veratrin in water.

Treatment of parturient paresis, J. N. Ries (*Rec. Méd. Vét., 8. ser., 9 (1902), No. 15, pp. 479–480*).—Brief notes on the successful treatment of this disease with iodid of potash.

Infusion or injection in parturient paresis, J. Vlaskamp (*Tijdschr. Veeartsenijk. Maandblad, 29 (1902), No. 12, pp. 539–546*).—The author believes that this disease is due to suppression of milk secretion and that the treatment of the disease should be directed toward restoring this physiological process. The injection of potassium iodid was found to have more rapid effect than infusion of the same substance. Infusion of lukewarm water and air had no apparent effect upon the disease.

Differential diagnosis between parturient paresis and apoplectic puerperal septicemia, E. H. B. Gravenhorst (*Tijdschr. Veeartsenijk. Maandbled, 30 (1902), No. 2, pp. 81–84*).—Brief notes on the chief symptoms of these 2 diseases, which may be used in making a differential diagnosis.

Foot-and-mouth disease, J. G. Rutherford (*Canada Dept. Agr. Bul. 9, pp. 7*).—The author presents brief notes on the history of foot-and-mouth disease in Canada and the United States, together with an account of the symptoms, treatment, and methods of preventing this disease.

The apoplectic form of foot-and-mouth disease, Chapellier (*Rec. Méd. Vét., 8. ser., 9 (1902), No. 16, pp. 453–468*).—The author observed 19 cases of the apoplectic form of this disease. It was found that the animal might die suddenly while drinking and a variable quantity of liquid would be found in the trachea. In some cases the amount would be exceedingly slight. In other cases death resulted suddenly a short time after drinking. In these cases an autopsy showed that the trachea was filled with fluid. The author believes that these symptoms indicate a sudden development of an apoplectic condition in the brain. This supposition, however, is based on the symptoms only, and was not formed by an examination of the brain.

The latest recurrence of foot-and-mouth disease near Palermo, Griglio (*Gior. R. Soc. Accad. Vet. Ital., 51 (1902), No. 30, pp. 753–756*).—Brief notes are given on a recent outbreak of this disease, and also on the apparent immunity of Sicilian cattle to tuberculosis and on the successful treatment of rabies in a horse.

Baccelli's treatment of foot-and-mouth disease, A. Cinti-Luciani (*Gior. R. Soc. Accad. Vet. Ital., 51 (1902), No. 36, pp. 897–902*).—The intravenous injection of solutions of corrosive sublimate, as recommended by Baccelli in the treatment of foot-and-mouth disease was tested by the author in a number of cases. These experiments indicate that the treatment is of considerable importance in the control of the disease.

Foot-and-mouth disease and the method of Baccelli, V. Cantoni (*Gior. R. Soc. Accad. Vet. Ital., 51 (1902), No. 41, pp. 1025–1029*).—The author believes that Baccelli's remedy is perfectly reliable in the treatment of foot-and-mouth disease and that the discovery constitutes an important feature of the history of veterinary medicine.

Aspergillosis in cattle, A. Quaranta (*Gior. R. Soc. Accad. Vet. Ital., 51 (1902), No. 34, pp. 849–860*).—The author believes, as a result of a study of this disease, that aspergillosis may exist as a primary infection and that the disease may be readily differentiated from other similar diseases. In order to arrive at a thorough differential diagnosis it is recommended that the pulmonary tubercles be subjected to a microscopic examination.

Differential diagnosis of blackleg, K. D. Malinovski (*Arch. Vet. Nauk, St. Petersburg, 32 (1902), No. 12, pp. 1035–1038*).—Statistics are presented showing the distribution and economic importance of this disease in Russia. Since blackleg is most frequently mistaken for anthrax, the author presents an outline of the chief clinical symptoms and pathological lesions of these 2 diseases for the purpose of making a differential diagnosis a simple matter for practicing veterinarians.

Rinderpest in South Africa, D. Hutcheon (*Jour. Comp. Path. and Ther., 15*

(1902), No. 4, pp. 300–324).—The author discusses the origin and spread of this disease in Africa. The disease apparently spread southward from a central focus. The symptoms and post-mortem appearances are described in detail and notes are given on the ordinary means by which the disease is spread. Preventive vaccination against rinderpest has been accomplished in two ways, viz: By the way of bile, and serum, and a careful description is given of both of these methods. The use of pure fresh bile from animals suffering with the disease or from animals which have just died is the method devised by Koch and has given excellent results in practice. Another method makes use of glycerinated bile, while equally good results have been obtained from the use of preventive blood serum. The author presents notes on the curative action of this serum and on the general method of procedure in eradicating rinderpest from the herd.

Texas fever among cattle in the Netherlands, D. A. de Jong (*Tijdschr. Veeartsenijk. Maandblad, 29 (1902), No. 12, pp. 531–538, pl. 1*).—A microscopic examination was made of tissues of cattle which had died with symptoms of Texas fever. No ticks were found on the cattle, but the blood parasite of Texas fever was found in the tissues of affected animals, and it was therefore concluded that Texas fever exists in the Netherlands. The origin of the infection is not known.

Cases of pulmonary and pharyngeal actinomycosis in cattle, J. Kowalewsky (*Jour. Méd. Vét. et Zootech., 5. ser., 6 (1902), July, pp. 409–420, figs. 4*).—A classified table is presented of 19,084 cases of actinomycosis, arranged according to the part of the body most or primarily affected. These statistics are supplemented by further cases obtained from other countries, with special reference to the occurrence of the disease in the lungs and pharnyx.

Granulous contagious vaginitis in cows, P. Bergeon (*Jour. Méd. Vét. et Zootech., 5. ser., 6 (1902), Oct., pp. 598–601*).—Brief notes on 3 cases of this disease, in one of which permanganate of potash was used, with recovery as the result in 14 days.

Experimental studies on barbone disease of buffaloes, Blin and Carougeau (*Rec. Méd. Vét., 8. ser., 9 (1902), No. 20, pp. 571–586*).—According to the author's investigations of this disease it is an acute hemorrhagic septicemia due to a species of Pasteurella and common to nearly all of the countries of the extreme Orient. Notes are given on the morphology of the organism and on its behavior on various culture media. In inoculation experiments it was found that the organism was extremely virulent toward rabbits, guinea pigs, calves, adult cattle, buffaloes, dogs, and horses. Carnivorous animals were more resistant. It was found possible to immunize animals by the use of an attenuated virus. For the production of this virus the horse was found to be the most favorable animal. Notes are given on the technique of the preparation of an immunizing serum and on various methods of immunization. When small doses of virus, less than 1 cc., were inoculated simultaneously with 20 cc. of serum, a very persistent immunity was produced in cattle, calves, and buffaloes. When an injection of serum was given, followed by inoculation of virulent material, a refractory condition was likewise produced in the animal.

Barbone disease of buffalo in Indo-China, M. H. Schein (*Rec. Méd. Vét., 8. ser., 9 (1902), No. 11, pp. 345–348*).—The author states briefly the differences between this disease and true cattle plague. Formerly it was supposed that the buffaloes of Indo-China were dying of cattle plague; it was found, however, that the mortality among the buffaloes was very high, while cattle were not affected. The symptoms of the disease are briefly described. It was found that the disease could be experimentally transmitted to rabbits and calves.

The pseudo-cattle plague of Indo-China, Carré (*Rec. Méd. Vét., 8. ser., 9 (1902), No. 16, pp. 467–472*).—This disease, on account of its great mortality and rapid course, was for some time mistaken for true cattle plague. According to the author it is very probable that a number of contagious diseases exist among the cattle and buffaloes of Indo-China and that these diseases have not been sufficiently well studied to permit a certain differentiation. The author found by experiment that the period of incubation of the pseudo-cattle plague was less than that of the true cattle plague, and that the diseases differed in other respects.

Bovine pasteurellosis in the Malay Peninsula, CAROUGEAU (*Rec. Méd. Vét., 8. ser., 9* (*1902*), *No. 18, pp. 473–486*).—As a result of the author's investigations it is concluded that the epizootic outbreaks in the Malay Peninsula are not due to cattle plague, but rather to hemorrhagic septicemia of cattle or bovine pasteurellosis. These outbreaks may appear under 3 forms—septicemic or peracute, acute with various localizations, and chronic. They are all due to the same organism, which belongs to the genus Pasteurella. This organism exhibits great variations in virulence. It was found possible to immunize animals by vaccinating them with an attenuated form of the organism. It is believed also that the data obtained from a study of the disease in the Malay Peninsula are applicable to outbreaks observed in Indo-China.

The bacillus of contagious abortion, H. PREISZ (*Centbl. Bakt. u. Par., 1. Abt., 33* (*1903*), *No. 3, Orig., pp. 190–196, figs. 4*).—The author proceeded along the lines of technique recommended by Bang in order to obtain pure cultures of this organism. The bacillus develops best in a medium consisting of agar with peptone and salt and containing a moderate amount of oxygen. The best development is obtained at a temperature of 37° C.; the optimum content of oxygen was found at a depth of from 7 to 15 mm. under the surface of the medium. The author describes in detail the behavior of this organism upon any artificial cultures. It is not stainable according to the Gram method. Experiments with female guinea pigs indicated that the organism does not cause abortion in these animals.

Abortion in cattle. Scours in new-born calves, L. VAN ES (*North Dakota Sta. Bul. 54, pp. 151–167*).—The author briefly discusses 3 forms of abortion, viz, that due to mechanical injury, the form due to eating moldy food, and infectious abortion. As causes of vegetable nature the author mentions ergot, corn smut, and certain evergreen plants. Infectious abortion attacks horses, sheep, and goats, but more commonly cattle. It is believed that cows affected with the disease gradually recover. The symptoms are described in considerable detail. No medicinal treatment is known which is successful in checking the disease. Attention should be given to preventive measures, such as destruction of the fetus and after-birth and the disinfection of animals, stables, and premises. Directions are given for carrying out disinfectant measures.

Scours in calves usually appears soon after birth and has been shown to be connected with a disease of the lungs which may appear somewhat later. There is little hope of success in treating this disease by drugs, but subnitrate of bismuth, creolin, or salol may often be used with encouraging results. Attention should be chiefly directed, however, to disinfection of stables and premises.

White scour and lung disease in calves, J. D. STEWART (*Agr. Gaz. New South Wales, 14* (*1903*), *No. 1, pp. 1–10, figs. 6*).—This disease prevails in the older dairy regions of New South Wales to a considerable extent and causes a mortality which varies from 5 to 80 per cent. White scour and lung disease are associated as in other localities where the disease has been studied. Notes are given on the usual symptoms and complications as observed by the author. In preventing the disease it is recommended that care be exercised in introducing new stock, that new calf pens be constructed, that the posterior parts of the cow be washed, and that the umbilicus be ligatured and treated with carbolized oil immediately after birth. Infected calf pens may be freed of infection by antiseptic treatment and special attention should be given to the thorough cleansing of all receptacles which are used for holding milk to be fed to calves.

Ichthyosis in calves, S. ZERTZALOV (*Arch. Vet. Nauk, St. Petersburg, 32* (*1902*), *No. 12, pp. 1038, 1039*).—Brief notes are given on the symptoms which this disease usually presents, as observed in calves. The same disease occurs in man, but usually under a somewhat different form.

Diseases in sheep, W. G. Dowling (*Agr. Gaz. New South Wales, 14* (*1903*), *No. 1, pp. 15–17*).—Strangury is reported as affecting as high as 20 per cent of rams and wethers in certain flocks of sheep. The disease appears to be contagious and it is suggested that flies may be instrumental in carrying the contagion. The treatment for severe cases is of a surgical nature and consists in the opening of the sheath and thorough treatment with antiseptic solutions.

Pasteurellosis and strongylosis of sheep, J. Lignières (*Rec. Méd. Vét., 8. ser., 9* (*1902*), *No. 22, pp. 669–679*).—The author argues that pasteurellosis of sheep is due to the attack of a species of Pasteurella and that the disease may occur in a chronic form without the aid of an infestation by Strongylus. On the other hand the presence of these worms is favorable to the bacterial infection.

The vaccination of Algerian sheep against sheep pox, E. Nocard (*Rev. Vét. Toulouse, 27* (*1902*), *No. 11, pp. 731–737*).—A controversial article in which the action of the French Government in its attempts to check this disease is justified.

Swine erysipelas serum, L. Deutsch (*Centbl. Bakt. u. Par., 1. Abt., 33* (*1903*), *No. 3, Orig., pp. 214–229*).—In the author's experiments the serum for preventive inoculation against swine erysipelas was obtained from horses exclusively. The bacillus which was used in producing the serum was tested and found to be capable of producing death in pigeons when administered in doses of 1 cc. The virulence of the bacillus was increased by 12 passages through pigeons, so that finally 1 cc. of culture proved to be fatal to pigeons within from 36 to 42 hours. The author made a number of observations upon the agglutinating action of the serum. It was found that the agglutinating power is diminished by each injection of bacillus for 1 or 2 days, but gradually increases until from the eighth day on a more rapid increase in the agglutinating power takes place. When the agglutinating power of the serum unexpectedly undergoes a rapid diminution it is safe to conclude that the protective power has also become suddenly diminished. In testing the protective power of swine erysipelas serum the author considers it unsatisfactory to depend upon results obtained from the inoculation of mice. Pigeons should be used for this purpose, and the birds selected should be in good health and should weigh from 300 to 400 gm.

The control of swine erysipelas, A. van Leeuwen (*Tijdschr. Veeartsenijk. Maandblad, 29* (*1902*), *No. 11, pp. 483–492*).—A number of experiments were made in testing methods for the control of this disease. As the result of his investigations the author concludes that the virus of swine erysipelas is generally distributed throughout the Netherlands and that preventive vaccination, so far from being useful, is actually dangerous. The author believes that the disease may be communicated to healthy pigs by the use of the vaccine. Good disinfectants and veterinary police measures are recommended in controlling the disease.

Combating swine erysipelas, J. J. Wester (*Tijdschr. Veeartsenijk. Maandblad, 30* (*1902*), *No. 2, pp. 49–63*).—The author presents an elaborate discussion of the means of controlling this disease, with special regard to vaccination. Vaccination is said to be the most rapid method of diminishing the number of cases of swine erysipelas. It is also believed that the danger of communicating the disease by vaccination to live animals is exceedingly slight. The author urges the great value of preventive vaccination as the general measure of control. The Netherlands, however, are considered as being generally infected with the disease, and it is recognized that the bacilli of swine erysipelas are regularly found in hogs in that country.

Serum diagnosis in hog cholera and swine erysipelas, E. Ercolani (*Gior. R. Soc. Accad. Vet. Ital., 51* (*1902*), *Nos. 27, pp. 690–693; 29, pp. 740–744*).—The author studied the action of physical agents upon the agglutinating substances in blood serum of animals affected with hog cholera. It was found that serum maintained at a temperature of 50° C. for 2 successive days retained its agglutinating power without any change. When serum was suddenly subjected to low temperatures, its agglutinating power was stronger than when subjected for a number of days to higher temperature. As a result of the author's studies upon these subjects it is concluded that the normal serum of experimental animals of the laboratory does not agglutinate the bacillus of hog cholera. Under the influence of a single subcutaneous injection of a culture of hog cholera bacillus the serum of hogs develops a slight agglutinating power. There is no relation between the agglutinating power of the blood serum of normal animals and the immunity or the natural susceptibility of these animals to hog cholera. There is also no connection between the agglutinating power of a serum of animals affected with hog cholera and its bactericidal power.

Prophylaxis of hog cholera, A. CINTI-LUCIANI (*Gior. R. Soc. Accad. Vet. Ital., 51* (*1902*), *No. 35, pp. 873–877*).—Attention is called to the great losses suffered among hogs as the result of this disease and to the desirability of securing some effective remedy which may be successfully employed on a large scale.

A method of vaccinating against hog cholera according to Poels, H. ANKER (*Tijdschr. Veeartsenijk. Maandblad, 30* (*1903*), *No. 2, pp. 63–80*).—The details of various methods of vaccination against this disease are discussed and the method of Poels was thoroughly tested by the author. As a result of these experiments it was found that the use of Poels's method may cause the death of healthy pigs. Vaccinated pigs may suffer from a chronic form of the disease and may die after a period of weeks or months. They may also contract the disease in an acute form. It is urged, therefore, that great caution should be observed in the use of this method since healthy pigs from 9 to 11 weeks old were found to be unable to withstand the operation.

Infectious catarrhal pulmonary inflammation in hogs, L. GREVE (*Deut. Tierärztl. Wchnschr., 10* (*1902*), *No. 52, pp. 491–493*).—A number of outbreaks of this disease were observed by the author. The incubation period appears to be about 10 to 14 days, but may be as long as 24 days. In older hogs the disease assumes a mild form, but in young pigs, 6 to 10 weeks of age, the affection is of a more serious nature. The disease may be transmitted from one animal to another by association in the same pen. During the first few days of the disease the animals cough rarely, but later the cough becomes more frequent and more violent. After a period of several weeks the symptom of coughing gradually becomes less marked, but affected animals appear never to recover entirely from the cough. During the first stage of the disease the anterior lobes of the lungs are affected to a considerable extent. A post-mortem examination and bacteriological tests furnish criteria for making the differential diagnosis between this disease and swine plague or other diseases with which it might be confused. In treating the disease it was found necessary to isolate affected animals and to keep them in warm quarters with good ventilation. The author tried 2 experiments in the use of creosote preparations in treating this disease. Creosotal was found to check the coughing in a pronounced manner within a short time. According to the author, the disease is apparently becoming less severe in localities where it has persisted longest.

Third report on surra of cattle and horses in the Protectorate of Togo, SCHILLING (*Centbl. Bakt. u. Par., 1 Abt., 33* (*1903*), *No. 3, Orig., pp. 184–189, fig. 1*).—Observations were made on 7 horses affected with spontaneous cases of this disease, and it was found that Trypanosoma might be absent from the blood and organs, especially the bone marrow. Attempts to immunize horses by inoculation with blood parasites which had first been passed through dogs were without result. Similar negative results were obtained from the use of material which had been passed through both dogs and rats. The incubation period in cases of natural infection was found to be not longer than 9 days, while the course of the disease occupied from 43 days to 8 months. Two experiments were made on steers, during which blood parasites were used which had been subjected to 8 passages through both dogs and rats alternately. The previous treatment of these blood parasites did not prevent the development of acute diseases. A quite pronounced parasitic property, however, was developed in the blood serum, and it is believed that some results may be hoped for from experiments along this line. Further experiments of the same sort on cattle and asses led the author to believe that the principle of immunization against African tsetse-fly disease has been found. In the process of immunization advantage was taken of the properties of the nagana parasites to become accustomed to the host, and in this way the virulence of the parasites toward a given species of animals was somewhat attenuated. A number of species of Glossina and Stomoxys were found, and brief notes are given upon these insects.

The American surra or mal de caderas, F. Sivori and E. Lecler (*An. Min. Agr. Argentina, Zoot. Bact. Vet. y Zool., 1 (1902), No. 1, pp. 79, pls. 51*).—The disease which passes under the name of mal de caderas has been known in different parts of South America, especially Brazil and Argentine, for a number of years. It is believed to have appeared first in the island of Marajo at the mouth of the Amazon. The earliest report concerning its ravages was made in 1860, and a number of outbreaks occurred during that time and recent years. The most serious outbreaks, however, have taken place since 1897. The authors describe in detail the symptoms of the disease as seen in spontaneous cases. Perhaps the most pronounced symptom is that of progressive anemia accompanied with irregular gait and partial paralysis of the posterior parts. There is usually an increased sensitiveness in the loins. So far as the authors have been able to observe the disease is uniformly fatal. A number of autopsies were made and detailed notes are given on the results of these examinations. The Trypanosoma, which is the cause of this disease, is closely related to those which are already known to be pathogenic for domestic animals, but is believed to be distinct from related species. Some days it may be found in large numbers in the blood, and on other days it may be entirely absent. The cause of this great fluctuation is not well understood. Notes are given on the biology and morphology of this parasite. The blood organism is able to live in shed blood for at least 4 days. Agglomeration of the parasites was observed in preparations of the blood of badly infested horses, in the peritoneum of inoculated guinea pigs, and in the blood of infected cats. The organism may be transmitted artificially to horses, mules, and various other species of mammals. The progress of the disease is rapid in rats, mice, and monkeys, while it is considerably slower in horses, cats, guinea pigs, rabbits, and dogs. In goats the disease appears to assume a chronic form, while birds and batrachia proved to be refractory. The disease appears naturally in horses and mules. The blood parasite may be transmitted by a species of Tabanus not determined, by *Musca brava*, or by species of Stomoxys. Mal de caderas is considered by the authors as being closely related to nagana and almost or perhaps quite identical with Asiatic surra.

The development of nagana and its variations according to the species of animal, A. Laveran and F. Mesnil (*Rev. Vet. Toulouse, 27 (1902), Nos. 9, pp. 569–580; 10, pp. 647–658; 11, pp. 714–728*).—The author describes in detail the symptoms of nagana as observed in rats, mice, dogs, monkeys, rabbits, guinea pigs, horses, cattle, sheep, and goats.

Trypanosoma disease other than dourine in Algeria, M. Buffard and G. Schneider (*Rec. Méd. Vét., 8. ser., 9 (1902), No. 23, pp. 721–727*).—In experiments which the authors undertook for the purpose of studying a supposed outbreak of dourine it was found that the organism with which they were working differed in its effects upon laboratory animals from that of dourine. The exact identity of the disease was not determined, but the possibility is suggested that the disease may prove to be surra.

Contribution to the serum diagnosis of glanders, M. A. Rabieaux (*Jour. Méd. Vét. et Zootech., 5. ser., 6 (1902), Aug., pp. 463–471*).—As a result of the author's investigations of this subject it is concluded that there is a marked difference between the agglutinating power of sera from glanderous and nonglanderous horses, and that this difference is sufficient to form a basis for the experimental diagnosis of glanders. Whenever the serum proves to be capable of producing agglutination when used in a dilution of 1 to 1,000 the animal from which the serum was obtained must be considered as glanderous. This method is considered by the author to be quite technical, and it is not recommended as displacing other methods under all circumstances.

The use of antitetanic serum, A. LABAT (*Rev. Vet. Toulouse, 27* (*1902*), *No. 9, pp. 580–586*).—The author's experiments in the use of antitetanic serum were made on horses which had received accidental or surgical wounds. Injections of this serum were made in 704 horses, 1 bull, and 1 ram. All the animals which were thus treated appeared to be protected against infection with tetanus; not a single case developed among the 706 animals. This treatment, while certain in its results, is but temporarily effective. The author believes that the immunization is not operative against the bacillus of tetanus, but merely against the toxin produced by the bacillus.

Enzootic bulbar paralysis in horses, M. H. J. P. THOMASSEN (*Tijdschr. Veeartsenijk. Maandblad, 29* (*1902*), *No. 10, pp. 438–457, pl. 1, fig. 1*).—A number of cases of bulbar paralysis were studied by the author. Notes are given on the distribution of the disease and experiments were made to determine its etiology. These studies were without definite results, since the author was unable to determine whether the disease was due to a bacterial organism or a vegetable toxin. The author believes, however, that the disease is due to a vegetable toxin which chiefly affects the medulla.

Pulmonary filariasis accompanying summer wounds, DROUIN (*Rec. Méd. Vét., 8. ser., 9* (*1902*), *No. 22, pp. 654–657*).—The author describes cases of this sort in horses which had been condemned as affected with glanders. Numerous tubercles were found in the lungs, which proved to be due to infestation with *Filaria irritans*.

Filaria papillosa on the serous covering of the liver and pigment deposits on the serous covering of the intestines in horses, N. VUISOTSKI (*Arch. Vet. Nauk., St. Petersburg, 32* (*1902*), *No. 12, pp. 1046, 1047*).—A number of cases of infestation of horses with this parasite were observed and notes are given on the apparent connection between the presence of the parasite and pigmented deposits on the external walls of the intestines.

Cases of epizootic lymphangitis in the form of chronic papular conjunctivitis in horses, I. G. USENKOV (*Arch. Vet. Nauk., St. Petersburg, 32* (*1902*), *No. 12, pp. 1039–1046*).—The author presents notes on cases of this disease in horses, giving the clinical symptoms, pathological lesions, diagnosis, and treatment. In treating the disease the author recommends local anesthesia by means of cocaine, removal of the papules, and treatment of the affected surfaces with antiseptics, such as carbolic acid.

Parasitic dermatitis, CADÉAC (*Jour. Méd. Vét. et Zootech., 5. ser., 6* (*1902*), *Sept., pp. 520–522*).—Brief notes on a skin disease of horses, due to *Dermofilaria irritans*.

Contribution to the study of botryomycosis, V. LAFARGUE (*Rev. Vet. Toulouse, 27* (*1902*), *No. 12, pp. 772–784*).—Notes are given on the etiology, symptoms, and various forms of this disease, which occurs in horses and other animals as well as man, and is due to *Botryomyces equi*. A detailed description is given of the symptoms and pathological anatomy observed in the acute skin form of the disease.

The sting of Bombus terrestris and the serious symptoms which it produces in horses, R. BISSAUGE (*Rec. Méd. Vét., 8. ser., 9* (*1902*), *No. 11, pp. 337–341*).—In cases where the sting of this insect caused serious symptoms the author obtained good results from the use of subcutaneous injections of sulphate of veratrin. It is argued that the more severe symptoms can not be due entirely to the action of formic acid but that some other substance must be present in the virus of the bees.

The pathological importance of botfly larvæ in the stomach of a horse, E. PERRONCITO (*Gior. Soc. R. Accad. Vet. Ital. 51* (*1902*), *No. 32, pp. 801–805*).—Descriptions are given of a few cases in which botflies caused the death of horses as a result of lesions produced in the stomach.

Flatworms parasitic in domesticated animals, R. S. McDougall (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 15 (1903), pp. 279–311, figs. 12*).—Notes on the habits, life history, and means of combating *Distomum hepaticum, D. lanceolatum, D. macrostomum, Tænia saginata, T. marginata, T. solium, T. serrata, T. echinococcus T. crassicollis, Moniezia expansa, Bothriocephalus latus*, etc.

Poisonous properties of certain species of Equisetum, C. E. J. Lohmann (*Jour. Landw., 50 (1902), No. 4, pp. 397–404*).—Feeding experiments were conducted with a number of species of Equisetum, and the results are given in detail in the present paper. Parts of the fruiting specimens of *Equisetum arvense* were fed to rabbits without producing any poisonous effects. Sterile sprouts were also fed to rabbits with negative results. *E. palustre* when fed to rabbits produced peculiar spasms and resulted in death in some cases. This species is believed to contain a nerve or muscle poison. *E. sylvaticum* was also found to be somewhat poisonous although less so than *E. palustre*. *E. maximum*, *E. pratense*, and *E. limosum* were fed to animals with negative results. Filtered extracts from *E. sylvaticum*, *E. arvense*, *E. limosum*, *E. pratense*, and *E. maximum* were injected into rabbits, with negative results. The explanation of these results is not understood by the author. It is believed, however, that the poisonous principles of the different species are not identical.

Permanganate of potash in the treatment of ulcerous keratitis, B. Danou (*Rev. Vet. Toulouse, 27 (1902), No. 10, pp. 646, 647*).—Experiments were made in the treatment of 4 dogs for this disease. A solution of potassium permanganate was used in the proportion of 1 part to 2,000 of tepid water. Excellent results were obtained in all cases.

Preventive treatment for rabies in horses by means of intravenous injections of rabies virus, A. Conte (*Rev. Vet. Toulouse, 27 (1902), No. 7, pp. 434–442*).—The author treated 5 horses which had been bitten by mad dogs. The treatment consisted of intravenous injections of material obtained from the medulla of rabid dogs. In these experiments 5 cc. of an emulsion of the virus was injected into the jugular vein in each animal. Four of the animals died ultimately with pronounced symptoms of rabies. The treatment began within from 3 to 6 days after the animals were bitten. It appears, therefore, that this treatment is of little value in preventing the appearance of rabies in horses.

The histological diagnosis of rabies in dogs, A. Rabieaux (*Jour. Méd. Vét. et Zootech., 5. ser., 6 (1902), Dec., pp. 703–716, figs. 2*).—The author made extensive observations on the anatomical effects of rabies upon different organs, especially parts of the nervous system. As a result of these observations, which confirm those already published upon the same subject, the author believes that as a rule in cases of natural infection by rabies in dogs well-marked lesions are produced in the plexiform ganglia and that where these lesions are not found it may be confidently concluded that rabies was not present.

Pseudorabies of dogs, A. Tomiolo (*Gior. R. Soc. Accad. Vet. Ital., 51 (1902), No. 39, pp. 977–987*).—Inoculation experiments were made for the purpose of diagnosing an apparent case of rabies. It was found, however, that all of the symptoms of rabies were not present in an apparently rabid animal and an inoculation of 8 rabbits with brain material obtained from the suspected animal gave negative results in all cases. Notes are given on the means of differential diagnosis between true rabies and this disease.

Pseudo-tuberculosis in dogs, Ducourneau and P. Jayles (*Rev. Vét. Toulouse, 27 (1902), No. 8, pp. 501–508, fig. 1*).—A detailed account is given of the appearance and development of this disease in a dog. A post-mortem examination was made, together with bacteriological tests. It is believed that the disease is due to a pathogenic organism which gains entrance into the venous system through the vessels of the intestines. One of the symptoms is the appearance of enteritis, which later gives place to more serious symptoms, including tympanites. The pathological anatomy of this disease is described with special reference to the condition of the liver.

Treatment of eczema in dogs by subcutaneous injections with artificial serum, Pécus (*Jour. Méd. Vét. et Zootech., 5. ser., 6 (1902), Oct., pp. 601–603*).—Good results are reported from the hypodermic injection of salt solutions in cases of eczema in dogs.

The effect of the injection of micro-organisms into the portal system on the sterility of the bile in the gall bladder, E. S. Carmichael (*Jour. Path. and Bact., 8 (1902), No. 3, pp. 276–279*).—The author's experimental investigations were made on rabbits, the micro-organisms being coli bacillus and Streptococci. Typhoid bacilli were also used on 1 animal. It was found that, in all these experiments except one, in the injection of micro-organisms into the portal system in quantities varying from 5 minims up, the bile retained its normal condition, thus indicating that micro-organisms can not pass through the normal hepatic tissue. Animals injected with *B. coli communis* and killed within 12 hours after the injection were found to possess absolutely sterile bile.

An epizootic among guinea pigs caused by a variety of coli, bacillus, K. Kovárzik (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 2, Orig., pp. 143–149*).—An outbreak of an epizootic nature occurred among the guinea pigs used for experimental purposes in the veterinary high school at Budapest. An investigation of the subject disclosed the fact that this disease was due to infection with a bacillus of the coli group. Notes are given on its growth and behavior on various culture media. Inoculation experiments were made on a number of animals. The organism was found to be pathogenic for rabbits, pigeons, guinea pigs, and sparrows. Dogs proved refractory. The bacillus was not destroyed by heat for 1 hour at a temperature of 60° C. A bibliography of the literature of this subject is appended to the article.

A new micro-organism which causes infection in animal pens, Schwer (*Centbl. Bakt. u. Par., 1. Abt., 33 (1902), No. 1, Orig., pp. 41–47, figs. 2*).—A study was made of an infectious disease which broke out among guinea pigs and other experimental animals in a laboratory. It was found that this organism produced an infectious disease of very rapid and fatal course. The clinical symptoms were therefore not very well defined. The post-mortem findings were, however, quite characteristic. The liver and spleen were greatly enlarged and exhibited extensive necrotic foci. The lungs were hyperemic and extensive microscopical alterations were produced in various organs. Notes are given on the appearance of the organism and its behavior on various culture media. It was found to be pathogenic for guinea pigs, rabbits, and mice, and appears to be most closely related to the bacillus of fowl cholera.

Determination of the value of fowl cholera serum, F. H. Mosler (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 3, Orig., pp. 230–235*).—A number of cultures of fowl cholera bacillus were utilized in these experiments and the experimental animals were chickens and mice. It was found that in the use of a culture of fowl cholera bacillus so virulent that 2 loops of the material would kill a mouse weighing 20 gm. within a period of 24 hours, a prophylactic effect could still be produced by the antiserum of Jess and Piorkowski, even if this serum had been kept for a period of 1 year.

MISCELLANEOUS.

Fifteenth Annual Report of Colorado Station, 1902 (*Colorado Sta. Rpt. 1902, pp. 75–218*).—This includes the organization list; a financial statement for the fiscal year ended June 30, 1902; a report of the director on the work of the station and substations, including a subject list of station publications; an inventory of station equipment; a list of exchanges; and departmental reports, parts of which are noted elsewhere. Brief reports of the field agents and of the work done at the Plains Substation are also included.

Fifteenth Annual Report of Illinois Station, 1902 (*Illinois Sta. Rpt. 1902, pp. 16*).—This includes an enumeration of the principal lines of station work, a list of station publications, and a detailed financial statement for the fiscal year ended June 30, 1902.

Special Report of Illinois Station, February, 1903 (*Illinois Sta. Spec. Rpt. Feb., 1903, pp. 405*).—This report is made up of publications of the station relating to the live-stock, corn, soil, horticultural, dairy, and sugar-beet investigations which have been carried on by the station for nearly 2 years under State appropriations. Results obtained along the different lines are briefly summarized, suggestions are made as to future work, and a financial statement is included. More detailed progress reports, issued as Circulars 62–67, and noted elsewhere in this issue, are also made on the lines of work mentioned. The regular bulletins of the station included are Nos. 73–78 and 82–84.

Tenth Annual Report of Minnesota Station, 1902 (*Minnesota Sta. Rpt. 1902, pp. XIX + 265*).—This includes the organization list of the station; a report of the director containing a financial statement for the fiscal year ended June 30, 1902, and a review of the different lines of station work; a reprint of Class Bulletin 12, entitled Outline of Greenhouse Laboratory Work (E. S. R., 14, p. 870), and reprints of Bulletins 73–76 of the station on the following subjects: Growing swine of various breeds and crosses (E. S. R., 14, p. 284); human food investigations (E. S. R., 14, p. 274); fattening lambs (E. S. R., 14, p. 796); and fattening steers (E. S. R., 14, p. 794).

Fourteenth Annual Report of New Hampshire Station, 1902 (*New Hampshire Sta. Bul. 96, pp. 109–140*).—This includes the organization list of the station, a financial statement for the fiscal year ended June 30, 1902, reports of the vice-director and heads of departments, parts of which are noted elsewhere, a summary of meteorological observations, and a list of station publications available for distribution.

Director's report for 1902, W. H. JORDAN (*New York State Sta. Bul. 229, pp. 457–471*).—This is a report of the director upon the work of the station during the year. Notes are given on the station staff, mention is made of needed equipment, the results of fertilizer and feeding stuff inspection during the year are briefly summarized, and station work along the lines of bacteriology, botany, entomology, and horticulture is outlined. A list of bulletins published in 1902 is appended.

Twenty-fifth Annual Report of North Carolina Station, 1902 (*North Carolina Sta. Rpt. 1902, pp. 118*).—This includes the organization list of the station; reports of the director and heads of departments on the work of the station during the year; a financial statement for the fiscal year ended June 30, 1902; several miscellaneous papers noted elsewhere in this issue, and reprints of press bulletins on the hair snake (*Gordius variabilis*) and cotton anthracnose, and of Bulletin 181 of the station on silk culture (E. S. R., 14, p. 784).

Fifteenth Annual Report of Vermont Station, 1902 (*Vermont Sta. Rpt. 1902, pp. 193–352 + XXXVIII*).—This includes the organization list of the station; an announcement concerning the work undertaken by the station; a financial statement for the fiscal year ended June 30, 1902; a report of the director, containing a list of available station publications and a brief discussion of the relation of the station to the public and to the State; abstracts of Bulletins 88–94, and departmental reports abstracted elsewhere.

Reports of the agricultural experiment stations in Austria (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 4, pp. 395–536*).—This includes reports of the following institutions for 1902: Agricultural experiment station for plant culture, Brünn; experiment station of the Lower Austrian agricultural, horticultural, and viticultural school, Feldsberg; agricultural chemical experiment and seed control station, Gratz; seed control station of the agricultural secondary school, Kaaden; agricultural chemical experiment station of the Royal Imperial Agricultural Society of Carnithia, Klagenfurt; agricultural chemical experiment station for Carniola, Laibach; agricultural experiment station, Lobositz; agricultural chemical experiment station, St. Michael-on-the-Etsch, Tyrol; agricultural chemical experiment station of the agricultural council for Upper Austria, Otterbach, near Schärding; agricultural physiological experiment station of the Bohemian section of the agricultural council for the Kingdom of Bohemia at the Royal Imperial Bohemian Technical High School, Prague; experiment station for the brewing industry in Bohemia, Prague; experiment station for the sugar industry, Prague; Royal Bohemian Agricultural Academy, Tetschen-Liebwerd; experiment station for flax culture and the manufacture of flax products, Trautenau; agricultural botanical experiment and seed control station, Troppau, and agricultural botanical experiment station, Tabor.

Crop Reporter (*U. S. Dept. Agr., Division of Statistics Crop Reporter, Vol. 4, Nos. 10–12, pp. 8 each*).—These numbers are made up as usual of statistical information on the condition of crops in the United States and foreign countries, and are the issues for February, March, and April, 1903.

Our foreign trade in agricultural products, 1902, F. H. HITCHCOCK (*U. S. Dept. Agr., Division of Foreign Markets Circ.* [illegible], *pp. 24*).—This is issued as a supplement to Bulletin 27 (E. S. R., 14, p. 304), and gives statistics on the imports and exports of the United States during 1902. As compared with 1901 the agricultural imports increased from $391,931,051 to $413,744,557 and the agricultural exports decreased from $951,628,331 to $857,113,533.

The cotton-oil industry in America, D. A. TOMPKINS (*Cassier's Mag., 24 (1903), No. 1, pp. 45–54, figs. 10*).—The history and the present status and importance of the industry are discussed. The article contains a diagram showing the cycle of production, consumption, and land restoration in case of cotton.

Utilization of wood waste, E. HUBBARD, trans. by M. J. SALTER (*London: Scott, Greenwood & Co., 1902, pp. XVI+192, figs. 50*).—This is a translation of the second, revised and enlarged, German edition of this work, which contains, besides general remarks on the utilization of sawdust, chapters dealing with the use of sawdust as fuel with and without simultaneous recovery of charcoal and the products of distillation; the manufacture of oxalic acid, ethyl alcohol, dyes (organic sulphids and mercapto dyes); artificial wood and plastic compositions and wood compositions for molded decorations from wood waste; the employment of sawdust in the preparation of blasting powders and gunpowders, in briquettes, in the ceramic industry as an addition to mortar; the manufacture of paper pulp from wood; the production of wood wool, and miscellaneous applications of sawdust and wood refuse.

Unirrigated lands of eastern Colorado, J. E. PAYNE (*Colorado Sta. Bul. 77, pp. 16, figs. 4*).—The results of observations made by the author during 7 years' study of the soil, climate, natural vegetation, water supply, settlement, cultivated crops, and live stock industry of the Great Plains of eastern Colorado are recorded. "Stock raising must be the basis of all successful agricultural efforts in this region, and crop raising should be generally attempted as an aid to stock raising."

The Bermuda Islands; an account of their scenery, climate, productions, physiography, natural history and geology, with sketches of their discovery and early history, and the changes in their flora and fauna due to man, A. E. VERRILL (*New Haven, Conn.: Author, 1903, pp. X+548, pls. 40, figs. 280*).—The purpose of this volume is to give a convenient and comprehensive account of the history, natural features, and productions of the islands. It is intended for the use of tourists, students, and the inhabitants of the islands. The subjects considered include general description, physiography, principal productions, exports, and changes in the flora and fauna due to man. The last-named part of the volume is further subdivided and contains a discussion of the character and origin of the native flora, the effects of deforesting, the introduction of useful plants, injurious weeds, and various species of animals, and the extermination of native birds. Especial attention is devoted to a discussion of the insects found in the Bermuda Islands. Among the numerous species of insects many of the more injurious pests common to the United States are noted. The parts of this volume dealing with climate and soils are noted elsewhere.

The Iowa yearbook of agriculture, J. C. SIMPSON (*Iowa Dept. Agr. Yearbook, 1902, pp. 764, pls. 20, figs. 57*).—This volume contains extracts from the Iowa road laws, an account of the State farmers' institute and agricultural convention and of a meeting of the State board of agriculture in 1902, together with a weather and crop report and the reports of the State college and of the State Dairy Commission. The proceedings are reported of the Improved Stock Breeders' Association, the Iowa Swine Breeders' Association, Iowa Dairy Association, and Iowa Park and Forestry Association. Notes are also given on various farm crops and live stock, statistics of the farms, crops, live stock, reports of county and district societies, and copies of a number of papers read before farmers' institutes.

Eighth report of the Bureau of Agriculture, Labor, and Industry of the State of Montana, J. A. FERGUSON (*Helena, Montana: Bureau Agr., Labor, and Ind., pp. VIII+733, pls. 30, figs. 82*).—A brief historical and descriptive account of Montana is presented, together with a discussion of the land, agricultural industries, live stock, labor, mines, various new industries, and miscellaneous matters relating to population, markets, assessed valuation, taxes, municipal ownership, libraries, sociological investigations, etc. Among the new industries special mention is made of various mining enterprises, the preservation of railroad ties, manufacture of macaroni, and development of oil fields.

Agricultural education in Hungary, J. SPEIR (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 15 (1903), pp. 33–52, figs. 12*).—This is a general account of the development and present status of agricultural education in Hungary. There are at present 3 grades of institutions giving instructions in agriculture, viz, agricultural colleges at Magyar-Ovár and Debreczen; intermediate schools at Keszthely, Kassa, and Kolozsvar, and 21 farm schools. There are also 11 itinerant instructors in agriculture.

List of national, State, and local commercial organizations, and national, State, and local agricultural associations (*Washington: Govt. Printing Office, 1903, pp. 296*).

NOTES.

Arkansas Station.—R. L. Bennett, director of the station since 1890, has resigned to go into private business. He left the station June 30.

Colorado College and Station.—W. L. Carlisle, professor of animal husbandry in the Wisconsin University and Station, has been elected agriculturist of the college and station and will take up his new duties in the fall. H. H. Griffin, field agent for the Arkansas Valley, located at Rocky Ford, has resigned to enter the employ of a sugar-beet company and has been succeeded by P. K. Blinn. The latter has charge of the cooperative experiments which the station is carrying on with the farmers in the valley, and is studying its agricultural development. The station at Rocky Ford has been rented to a progressive farmer, who is a graduate of the college, with the understanding that he will conduct experiments along certain lines without expense to the station.

Florida University.—The last legislature gave the university about $60,000 for maintenance for the biennial period. The appropriation for buildings was declared unconstitutional in the form in which it passed. The veterinarian of the university and station was made ex officio State veterinarian. H. G. Dorsey, assistant professor of physics, has resigned to accept a position in a Rochester, N. Y., institution. The board at its last meeting abolished coeducation at the university.

Hawaii Station.—Press reports state that the agricultural appropriations made by the Territorial legislature, which amounted as passed to $41,600, includes $7,500 in aid of the Federal experiment station.

Idaho Station.—J. S. Burd, assistant in the Bureau of Chemistry of this Department, has been appointed chemist to the Idaho Station, vice H. B. Slade who severed his connection with the station several months ago. Mr. Burd entered upon his duties July 1.

Iowa College and Station.—F. R. Marshall, assistant in animal husbandry, has resigned his position to take charge of the live-stock work at the Brookmont Farm, Odebolt, Iowa, where the station has carried on extensive cooperative feeding experiments. He has been succeeded by W. J. Rutherford of Guelph, Canada.

Kentucky Station.—Hon. F. A. Hopkins, Prestonburg, has been appointed a member of the board of trustees to succeed J. B. Marcum, deceased, and Dr. T. Carpenter, Scottsville, has been appointed to succeed B. W. Bradburn, resigned. D. W. May has been granted leave of absence during August and September and will spend the time in England and Scotland studying live-stock and breeding interests in those countries. George Roberts, assistant chemist, has resigned to accept a position in the chemical department of the California Station, in charge of the fertilizer control provided for by the recent act of the legislature of that State.

Maine University and Station.—At a recent meeting of the trustees of the university it was voted to establish a secondary school in agriculture with a two-years' course, entirely distinct from the college courses. The school will open the coming fall. It will consist of a fall, spring, and summer term the first year, and a fall and spring term in the second year, making a total of five terms aggregating sixty-two weeks. S. C. Dinsmore, a graduate of the university in the class of 1903, has been elected chemist, vice E. R. Mansfield, resigned.

Maryland College and Station.—James S. Robinson, horticulturist, has retired from active charge of the horticultural work in the college and station, but will retain a nominal connection with the institution. M. M. Strong, M. S., has been elected assistant chemist to the station. Mr. Strong is a graduate of the Maryland college and has been for several years an assistant in the fertilizer inspection, but has spent the past year in special study at Johns Hopkins University.

Massachusetts College and Station.—Francis Canning has been appointed instructor in floriculture and will have charge of the greenhouses. Neil F. Monahan, a graduate of the college, has been appointed assistant in the botanical department of the station, and G. F. Freeman, of Alabama Polytechnic Institute, assistant in the inspection work in botany, vice R. E. Smith. A general revision of the course of study has been made which will go into effect at the beginning of the new college year. Electives are offered during both the junior and senior years. The State board of agriculture has recently issued a special report by C. H. Fernald and A. H. Kirkland, on the brown-tail moth, which is now doing so much damage to fruit and shade trees in the eastern part of the State.

Missouri College and Station.—H. J. Waters, dean and director, has been appointed superintendent of agriculture for the Missouri exhibit at the St. Louis Exposition and has been granted a leave of absence to take up this work. F. B. Mumford has been appointed acting dean and director in his absence. An addition is to be built to the new horticultural building, which is now occupied by the departments of horticulture, entomology, and botany. The addition will be used for experimental work in botany along physiological, pathological, and ecological lines. A feeding shed 300 feet long and 30 feet wide is being built. This is intended primarily for the large feeding experiment which is being conducted in cooperation with the United States Department of Agriculture.

Montana College and Station.—Samuel Fortier, director and irrigation engineer, has been granted leave of absence from the college and station for one year and has assumed charge of the irrigation work of this Office which is being carried on in California in cooperation with the State and the University of California.

Nebraska University.—Frank G. Miller of the Yale School of Forestry has been elected professor of forestry.

New Hampshire College and Station.—The State legislature has appropriated a total amount of $40,000 for the college, $15,000 of which is for general expenses, $13,000 for equipping the new agricultural and horticultural building, $7,000 for a greenhouse, and $5,000 for additions to the heating plant. Edith M. Davis has been appointed purchasing agent of the college and clerk of the station in the place of F. C. Keith.

New York State Station.—Milo H. Olin of Perry and Irving Rouse of Rochester have been appointed on the board of control, to succeed Oscar H. Hale and M. L. Allen, whose terms expired; and C. W. Ward of Queens, to succeed E. A. Callahan, deceased. The cattle barn, constructed to replace the one which was destroyed by fire last year, has been completed and the remodeled administration building is being occupied. Plans are under way for a new horse barn for which an appropriation of $5,000 was made by the last legislature, and for a fire protection system to cost $5,000.

Cornell University.—Owing to the failure of the State to appropriate means for the maintenance of the college of forestry, established by the State at Cornell University, the trustees of the university have decided to suspend instruction in that college until the means for its maintenance are provided by the State, and have declared all positions on the instruction force, including that of director, vacated. There was a prospect of an attendance of about one hundred students at the school next fall.

Ohio University and Station.—Thomas F. Hunt has resigned his position as dean and professor of agriculture in the university, to become professor of agronomy at Cornell University. He entered upon his new position July 1. H. C. Price, a graduate of the university and recently horticulturist at the Iowa College and Station, has veen elected dean and professor of rural economics, and M. F. Miller has been made assistant professor of agronomy. John F. Hicks, assistant botanist at the Ohio Station, was shot by an unknown person just as he was preparing to leave Wooster the night of May 31. Mr. Hicks had resigned his position to engage in business in Cleveland.

Oklahoma College and Station.—J. F. Nicholson, of the New York State Station, has been appointed assistant in bacteriology in the college and station. Provision has been made for the appointment of an assistant in agriculture. C. O Pearcy, clerk and stenographer, has resigned.

Pennsylvania College.—The total appropriation for the college made by the State legislature at its recent session was $250,805.55. Of this amount $100,000 is for the purpose of assisting in the erection, equipment, and furnishing of a building for the department of agriculture of the college, while $150,000 additional is virtually pledged by the attachment of a proviso requiring the trustees of the college to file with the auditor-general plans, specifications, and estimates satisfactory to him showing that the entire cost of the building and equipment will not exceed $250,000. At no stage in the progress of the bill through the legislature was a single vote recorded against it. The amount was voluntarily increased by the appropriation committee from $225,000 to $250,000. The college announces the resumption of the short course in agriculture, which has been suspended for the past four years. The course next winter will begin January 6 and continue until March 30. The short creamery course will begin at the same time and close March 2.

South Carolina College and Station.—The board of trustees has voted to erect an agricultural building to cost $50,000, providing full accommodation for the agricultural department and its various divisions. J. S. Newman has been appointed director of farmers' institutes. It was planned to hold thirty-one local institutes during the month of July, and a State institute to be held at the college August 10 to 14.

Utah College and Station.—G. L. Swendsen, professor of civil engineering and hydraulic engineer to the station, has resigned to accept an appointment with the U. S. Geological Survey. W. M. McLaughlin, a graduate of the college in 1895, has been appointed his successor in the station, and will give his whole time to the station work. W. D. Beers, assistant irrigation engineer, has severed his connection with the college and station. In accordance with the recent provision of the State legislature 6 farms have been located by the station in different parts of the State for experiments in dry farming. These include 40 acres each, and were donated in each case by the county, which also paid the expense of clearing and fencing them. No buildings or permanent equipments will be provided, the team work being hired. A competent laborer will be placed in charge of each farm, and the station will exercise a close supervision of the work. Trials will be made mainly with grains and forage crops grown without irrigation.

Vermont Station.—F. M. Hollister, B. S., of the class of 1903, has been appointed assistant chemist.

Washington Station.—The State Station at Puyallup has been closed and the land rented to local parties who will look after the plants and fruits now growing. The legislature passed an appropriation of $12,000 for the station, but the bill failed to receive the governor's signature.

West Virginia College and Station.—John L. Sheldon, of the botanical department of the University of Nebraska, has been appointed professor of bacteriology in the university and station, and will enter upon his duties September 1.

FLORIDA AGRICULTURAL INSTITUTE.—The legislature of the State of Florida at its recent session provided for the establishment of an agricultural institute, for practical instruction in that subject, to be located at Kissimmee. An appropriation of $5,000 was made for establishing the institute, and $5,000 for its maintenance for two years.

CALIFORNIA POLYTECHNIC SCHOOL.—The first annual catalogue of this new school has recently been received. The State legislature in 1901 appropriated $50,000 for the establishment of the school, and it was located on a 280 acre tract of land near San Luis Obispo. The past winter the legislature appropriated $64,400 to complete the buildings undertaken, and for equipment and maintenance during the biennium. It is distinctly stated that the institution will not be of the college grade, and will not aim to prepare students to enter a higher institution of learning. "Its course of study is arranged solely in view of the needs of the boy and girl who are going to earn a livelihood after completing its course." This covers three years. The work of the first two years is prescribed for all students, and includes both agriculture and mechanics for the boys and domestic science for the girls. The third year about one-half the course is elective. The instruction will be both theoretical and practical, and much of the work on the farm and in erecting frame buildings for the farm will be done by the students. Two buildings, an admission building and a dormitory, each having two main floors and a high basement, are approaching completion. The school will open in September, and the prospects for the entering class are already good. The director, it will be remembered, is Dr. Leroy Anderson, formerly of the New York Cornell Station, and more recently of the California University and Station.

JAPANESE EXPERIMENT STATIONS.—The successful work of the local agricultural experiment stations in Japan has made it possible for the Ministry of Agriculture and Commerce to reduce the number of branch experiment stations connected with the Central Agricultural Experiment Station at Nishigahara, and to concentrate its efforts and funds on a smaller number of stations and fewer lines of work. Until April, 1903, there were 9 of these branch stations, but at that time 6 of them, viz, the Hokuriku, Too, Tokai, Shikoku, Sanio, and Sanin branch stations, were turned over to the control of the local governments, and the funds and staffs of these institutions were transferred to the Central Agricultural Experiment Station, and the 3 remaining branch stations, i. e., those at Kashiwabara, Idzumimura, and Hanadatemura. The funds available for the Central Station and its 3 branches for the fiscal year ending March 31, 1904, amount to $91,920. The total budget of the Ministry of Agriculture and Commerce for the same year is $3,386,713. The local stations referred to above now number 39. They receive subsidies from the Ministry of Agriculture and Commerce amounting to $65,000 a year and also funds appropriated by the local governments. The annual expenditures of these stations vary from $2,200 to $11,232. In addition to the stations supported by public funds, there are 3 private experiment stations. The island of Formosa supports 3 agricultural experiment stations and a tea experiment station, all of which are under the control of the Bureau of Industries of Formosa.

TOUR OF THE GERMAN AGRICULTURISTS.—The party of forty-four gentlemen, mostly landowners and members of the German Agricultural Society, who had been on a tour of this country since May 2, concluded their trip in New York June 24. The party visited points of agricultural interest in eighteen different States, and traveled for that purpose about 11,000 miles. At the request of the German Agricultural Society the itinerary of the trip had been arranged in this Department, and Mr. J. I. Schulte, of this Office, accompanied the party as conductor. A slight change was made to allow the visitors to go through the Yellowstone National Park, which was not originally included in the instructions from the society.

Considering the prominence of the gentlemen composing the party, and their intelligence in matters pertaining to agriculture, their impressions are interesting. In general it may be said that they found much to approve and admire, and that their criticisms were frank and fair minded, although they often failed to take into consideration the local conditions which prevail in this country. They commented very favorably upon the work of this Department in general, and especially approved its efforts to solve the practical problems of immediate interest to agriculture. The wide distribution of information by the Department strongly appealed to them.

Agricultural colleges and experiment stations were inspected in Kentucky, Iowa, California, Oregon, Minnesota, and Wisconsin. These institutions were considered well equipped for imparting scientific and practical knowledge, and consequently looked upon as one of the greatest factors in the rapid development of American agriculture. The methods of teaching stock judging met with hearty approval, and some of the party expressed themselves in favor of more rapid development of this feature of agricultural instruction in their own schools. As might have been expected, the military instruction given at the agricultural colleges proved of much interest. Exhibition drills were given at the Iowa and Oregon colleges, and the work of the cadets was commended.

Some surprise was expressed that in building up a dairy herd the American farmer evidently considers practically only the milk and butter production, while in Germany considerable attention is given to making the individuals of a herd alike in color and in form. The large milk and butter records called to their attention were generally looked upon with suspicion. The method of stabling cows in stalls with short floors and in stanchions was not approved of, although it was conceded that the animals might be kept more clean; this, however, at the sacrifice of comfort.

In studying horse raising and breeding, the greatest interest was exhibited in the breeds of distinctively American character, such as the Kentucky thoroughbred and the standard-bred horses. The desire of the visitors in general was not so much to see fine stallions or be impressed with track records, as to find out how the colt is reared, broken, and sold; how much it costs to produce a horse, and what is realized for him when placed on the market. In looking over draft horses, their interest was centered less on imported animals than on the generations produced on American soil and under American management.

The beet-sugar industry was an object of much interest, and they were favorably impressed with what they saw of the beet fields and factories; but considering the labor and other economic conditions in this country, the opinion prevailed that Germany presents certain advantages and that the competition of this country is likely to prove less serious than has been anticipated.

The agriculture, horticulture, and forestry of the Pacific Coast States received in general most favorable comment. That section of our country impressed itself upon the foreign visitors largely through its diversity in products and its fine tree growth. The reclamation of the "tule" lands in California proved of highest interest.

Perhaps the deepest impression was made by our forest conditions. The unanimous verdict of the party was that our management of the trees was extremely wasteful. Many were of the opinion that the day when the United States will import lumber is bound to come soon unless a radical change in our methods is made in the near future. The many fallen timbers and the evidences of comparatively recent forest fires in the Yellowstone Park were an eyesore to the party, and made it impossible for them to fully enjoy one of our greatest natural attractions.

The general conclusion of the visitors was that while they had seen many interesting features of agriculture in the United States, and were highly impressed with its rapid development and progress, the conditions here were so different that very few of our methods were directly applicable to agriculture in Germany.

ECONOMICS OF FARM MANAGEMENT.—The first part of a Syllabus of Lectures on Agricultural Economics, by Dr. Henry C. Taylor, of the University of Wisconsin, has been received. This first part is devoted to the economics of farm management, and is based upon a course of lectures delivered by the author during the past winter to the second-year short-course students in the college of agriculture. Following the introductory, there are chapters on crops and field systems—European and American, intensity of culture, productivity, the size of farms, prices of agricultural products, distribution of gross returns, the price of land, land tenure in the United States, means of acquiring land ownership, and the renting of land. "The writer makes no pretensions of having presented here a complete outline of the subject. The needs of the students and the material which the author had in hand determined the character of the course of lectures. Practically all of the time has been given to private agricultural economics, because the subjects included under this head are of more immediate interest to the farmer. The author hopes to find time to work this subject out much more completely in the near future."

MISCELLANEOUS.—Elwood Mead, in charge of irrigation investigations of this Department, has gone to Italy for the purpose of making a study of the methods of distributing and using water in that country, and the kinds and value of crops grown by irrigation. The annual rainfall in Italy being nearly 40 inches makes irrigation a matter of choice rather than of necessity, and gives the results a significance to irrigators in the eastern part of the United States which irrigation in arid countries like Egypt does not have. Mr. Mead will spend a month or more in the valley of the Po studying the irrigation systems in Lombardy and Piedmont. He will ascertain, if possible, how rivers are controlled, either by the State or by private interests, and will gather statistics of the prices paid for water, the amounts used, the way in which it is applied to crops, and the differences in products, yields, and value on irrigated and unirrigated land. In connection with his trip Mr. Mead will make briefer observations of irrigation in Switzerland and possibly southern France and Spain. If his time permits he will inquire into what is being done in the application of power to farm work, in the pumping of water and in irrigation and drainage, and what the agricultural experiment stations are doing to determine the efficiency of agricultural machinery.

Prof. W. O. Atwater, in charge of nutrition investigations of this Office, has gone to Europe, where he will spend the summer and fall in studying the progress of investigations on human nutrition in the leading laboratories and other institutions of England, France, Belgium, Switzerland, Italy, Austria, Germany, and, perhaps, Denmark and Sweden. He expects to return about the end of November.

Gifford Pinchot, Chief of the Bureau of Forestry of this Department, has been elected professor of forestry in the Yale Forest School. This appointment will make no change in his relation to the Bureau of Forestry, and will but slightly increase the work he has been doing for the school in the past. He will deliver a short course of lectures at New Haven during the first two weeks of November.

Prof. William H. Brewer has resigned the professorship of agriculture at the Sheffield Scientific School, Yale University, and has been appointed professor emeritus. The university conferred the degree of LL. D. upon him at the recent commencement.

Luther Burbank, of Santa Rosa, Cal., was awarded a gold medal by the California Academy of Sciences on the recent occasion of the celebration of its semicentennial anniversary. This was the highest honor conferred by the academy, and was awarded to Mr. Burbank for "meritorious work in developing new forms of plant life."

Prof. Thomas F. Hunt has received the degree of Doctor of Agriculture from the University of Illinois.

W. C. Welborn, formerly of the Mississippi Agricultural and Mechanical College, has gone to the Philippines, where he will be connected with the Bureau of Agriculture.

T. D. A. Cockerell, of the Normal University, at East Las Vegas, N. Mex., and consulting entomologist of the Arizona Station, has accepted a position in Colorado College, at Colorado Springs.

Harvard University has established a course in forestry, and R. T. Fisher has been appointed instructor in this subject.

We note from *Science* that L. Daniel has been elected to a newly established chair of agricultural botany at the University of Rennes.

The American Association of Farmers' Institute Workers held its annual meeting at Toronto June 23–26. The officers elected for the coming year were: President, B. W. Kilgore, of North Carolina; vice-president, E. E. Kaufman, of North Dakota; secretary, G. C. Creelman, of Ontario; executive committee, the president, secretary, and George McKerrow of Wisconsin, H. C. Easterly of Illinois, and J. C. Hardy of Mississippi. The meeting next year will be held at St. Louis.

The Seventh Annual Convention of the National Association of State Dairy and Food Departments was held at St. Paul July 21–24. The programme was a long one and included papers and discussions on food legislation, food standards, manufacture and preservation of foods, antiseptics, labeling, etc.

A bill has passed the State legislature of Massachusetts providing for the manufacture of vaccine lymph for free distribution in the State and placing this under the control of the State board of health. The lymph will be manufactured at the Bussey Institute. A bill appropriating $250,000 for combating the gypsy moth has been rejected.

We note from *Nature* that the annual report of the Royal Agricultural Society, adopted at the meeting held May 22, states that the council of the society has decided to organize an agricultural education exhibition as a new feature of its annual show, with a view to bringing before the public the general characteristics of the teaching now provided at agricultural colleges, and of drawing attention to the society's own share in this work as a national examining body.

The board of agricultural studies of the University of Cambridge reports that during the past year 169 students have received instruction in agricultural science. The income of the department is about $18,000. The need of a permanent building to accommodate the various branches of this work is becoming apparent and the matter is receiving the consideration of the board.

It is reported that the Viceroy of India will devote the £20,000 donated by Henry Phipps to the establishment of a laboratory for agricultural research, to be known as the Phipps Laboratory, and to be situated at Dehra Dun, and to a second Pasteur institute in the south of India. The donation will be devoted to providing the buildings. The government will contribute toward the maintenance of the agricultural laboratory and bear the whole expense in the case of the Pasteur institute.

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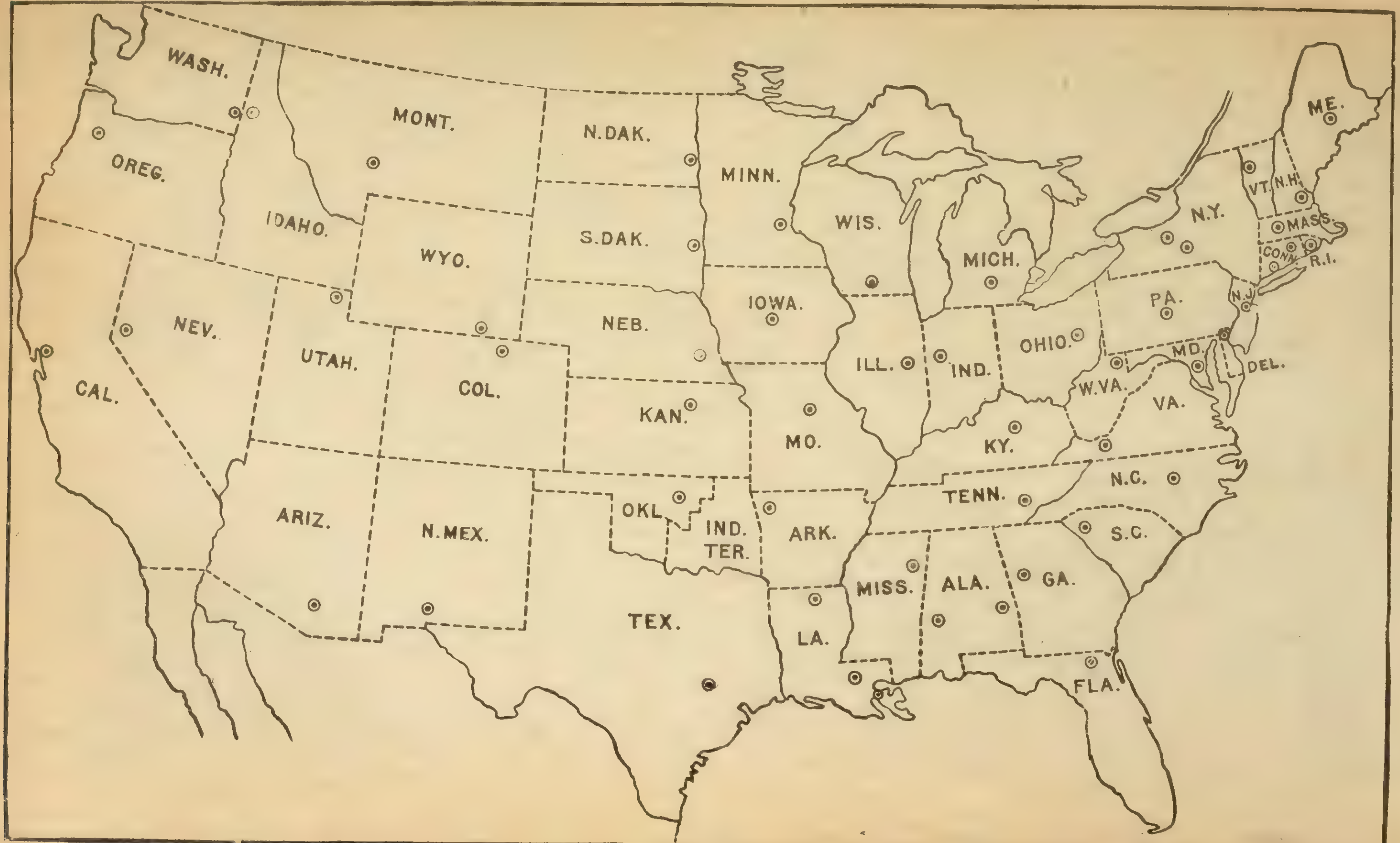

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